HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Pahsimeroi Summer Steelhead Hatchery Program
Species or Hatchery Stock:	Summer Steelhead - *Oncorhynchus mykiss* Pahsimeroi stock
Agency/Operator:	Idaho Department of Fish and Game
Watershed and Region:	
Date Submitted:	September 13, 2011
Date Last Updated:	November 2018

EXECUTIVE SUMMARY

The management goals for the Pahsimeroi River summer steelhead population are to provide sustainable fishing opportunities and to enhance, recover and sustain the natural spawning population. The population is considered an A-run and is listed as Threatened under the Endangered Species Act. Abundance, productivity, spatial structure and diversity of the Pahsimeroi River natural population have been rated as moderate risks by the Interior Columbia Technical Recovery Team (ICTRT).

The purpose of the Pahsimeroi River summer steelhead hatchery program is to mitigate for fish losses caused by the construction and continued operation of the Hells Canyon Complex. By operating a segregated harvest program, managers are attempting to maintain the existing mitigation program while reducing risk to the natural population. This strategy is expected to provide demographic and genetic benefits to the natural population by: 1) not reducing the number of natural-origin spawners from broodstock collection, 2) limiting the opportunity of hatchery-origin fish to spawn naturally.

The Hells Canyon Settlement Agreement calls for the production of 400,000 pounds of summer steelhead smolts (1.8 million smolts at 4.5 fish per pound). This represents the combined production from Pahsimeroi and Oxbow fish hatcheries. Of the 1.0 million juveniles produced from broodstock collected at Pahsimeroi Fish Hatchery, approximately 800,000 smolts are released in the Pahsimeroi River immediately downstream of the weir. The remaining 200,000 smolts are released in the Little Salmon River. Managers expect the smolts released into the Pahsimeroi River to produce approximately 6,400 returning adults above Lower Granite Dam. Broodstock collection and egg incubation is conducted at the Pahsimeroi Fish Hatchery. Final incubation and rearing is conducted at the Niagara Springs Fish Hatchery. All hatchery operations and a portion of monitoring activities are funded by the Idaho Power Company (IPC). Where appropriate, other sources of funding for monitoring activities are identified.
Key performance standards for the program will be tracked in a targeted monitoring and evaluation program. These standards include: (1) abundance and composition of natural spawners and hatchery broodstock (2) number of smolts released; (3) in-hatchery and post-release survival rates; (4) total adult recruitment, harvest and escapement of the natural and hatchery components; and (5) abundance, productivity and diversity of the naturally spawning summer steelhead population.

SECTION 1. GENERAL PROGRAM DESCRIPTION

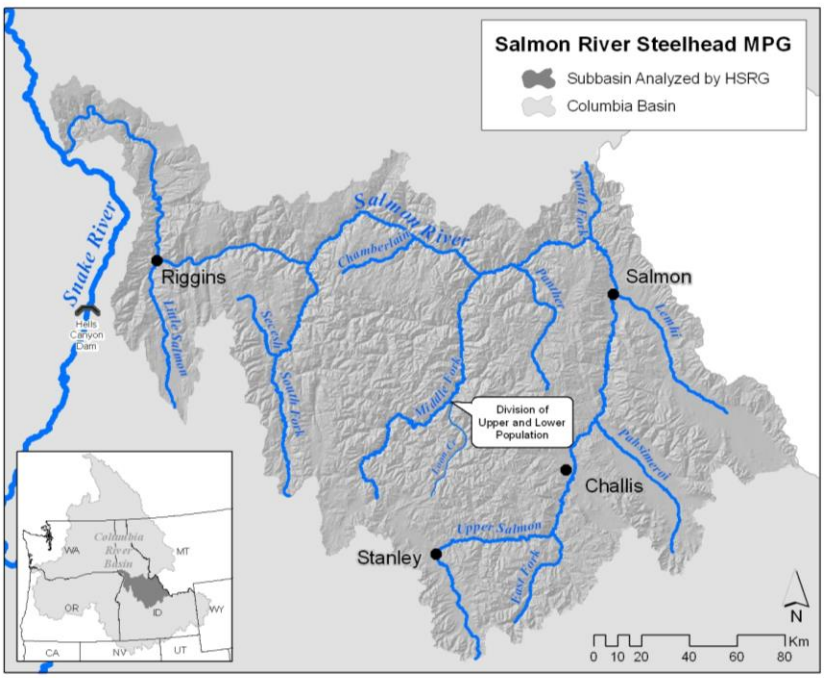
1.1 NAME OF HATCHERY OR PROGRAM

Hatchery: Pahsimeroi Fish Hatchery
Niagara Springs Fish Hatchery

Program: Pahsimeroi River Summer steelhead

1.2 SPECIES AND POPULATION (OR STOCK) UNDER PROPAGATION, AND ESA STATUS

Pahsimeroi summer steelhead (*Oncorhynchus mykiss*) are included in the Salmon River steelhead Major Population Group (MPG) in the Snake River Distinct Population Segment (DPS) and were listed as threatened under the Endangered Species Act in 1997. This MPG includes the South Fork Salmon River, Secesh River, Big Creek, Camas Creek, Loon Creek, Upper and Lower Mainstem Middle Fork Salmon, Little Salmon and Rapid rivers, Chamberlain Creek, Panther Creek, North Fork Salmon River, Lemhi River, Pahsimeroi River, and the East Fork Salmon River populations (Figure 1). The hatchery–origin steelhead in this program are not listed under the ESA.



Source: HSRG 2009

FIGURE 1. SALMON RIVER STEELHEAD MPG.1.3

RESPONSIBLE ORGANIZATION AND INDIVIDUALS

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On-site Operations Lead (Niagara Springs Fish Hatchery)
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Email: Todd.garlie@idfg.idaho.gov Other agencies, Tribes, cooperators, or organizations involved, including contractors, and extent of involvement in the program:

Idaho Power Company – Facility owner and sole funding source for operation and maintenance of Niagara Springs and Pahsimeroi fish hatcheries.

Name (and title): Stuart Rosenberger, Hatchery Biologist
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Hells Canyon Settlement Agreement Parties – signatories to the FERC approved agreement defining mitigation requirements for Idaho Power Company associated with construction and continuing operation of the Hells Canyon Complex. Parties include the Idaho Power Company (IPC), the National Marine Fisheries Service (NOAA Fisheries), the Idaho Department of Fish and Game (IDFG), the Oregon Department of Fish and Wildlife (ODFW), the Washington Department of Fisheries (WDF), and the Washington Department of Game (WDG) (now collectively the Washington Department of Fish and Wildlife (WDFW)).

1.4 FUNDING SOURCE, STAFFING LEVEL, AND ANNUAL HATCHERY PROGRAM OPERATIONAL COSTS

Pahsimeroi Fish Hatchery (broodstock collection, spawning and incubation)

Funded by Idaho Power Company
Staffing level: 3 FTE plus 40 months of seasonal labor
Annual budget: $555,390* as of FY18
**Budget includes production of steelhead released inot the Little Salmon R. and summer Chinook Salmon released at Pahsimeroi FH*

Niagara Springs Fish Hatchery (incubation, rearing and smolt release)

Funded by Idaho Power Company
Staffing level: 3FTE plus 54 months of seasonal labor
Annual budget: $587,740* as of FY18
* *Budget includes production releases at Hells Canyon and Little Salmon R.*

1.5 LOCATION(S) OF HATCHERY AND ASSOCIATED FACILITIES

Pahsimeroi Fish Hatchery – Pahsimeroi Fish Hatchery (PFH) is comprised of two separate facilities – the lower Pahsimeroi Fish Hatchery (lower PFH) and the upper Pahsimeroi Fish Hatchery (upper PFH). The lower PFH is located on the Pahsimeroi River approximately 1.6 kilometers above its confluence with the main Salmon River near Ellis, Idaho. The upper PFH is located approximately 11.3 kilometers upstream from the lower facility on the Pahsimeroi River. The river kilometer codes for the upper and lower facilities are 522.303.489.011 and 522.303.489.002, respectively. The hydrologic unit code for both facilities is 17060202.

Niagara Springs Fish Hatchery – Niagara Springs Fish Hatchery (NSFH) is located in southern Idaho along the middle Snake River approximately 16 kilometers south of Wendell, Idaho. The hydrologic unit code for NSFH is 17040212, which is part of the Upper Snake River Watershed.

1.6 TYPE OF PROGRAM

This program is operated as a Segregated Harvest program.

1.7 PURPOSE (GOAL) OF PROGRAM

The management goals for the Pahsimeroi River summer steelhead population are to provide sustainable fishing opportunities and to enhance, recover, and sustain the natural spawning population. The natural population is considered an A-run and is listed as Threatened under the Endangered Species Act.

The purpose of the Pahsimeroi River summer steelhead hatchery program is to mitigate for fish losses caused by the construction and continued operation of the Hells Canyon Complex. The Hells Canyon Settlement Agreement calls for the production of 400,000 pounds (1.8 million fish at 4.5 fish per pound) of summer steelhead smolts, of which 1.0 million are produced from this segregated harvest program at Pahsimeroi Fish Hatchery. Of the 1.0 million juveniles produced at Pahsimeroi Fish Hatchery, 800,000 are released in Pahsimeroi River immediately downstream of the weir. The remaining 200,000 smolts are released into the Little Salmon River.

1.8 JUSTIFICATION FOR PROGRAM

The Pahsimeroi River summer steelhead hatchery program was established under the Hells Canyon Settlement Agreement (HCSA) which calls for the production of 400,000 pounds of summer steelhead smolts (1.8 million smolts at 4.5 fish per pound) to mitigate for fish losses caused by the construction and continued operation of the Hells Canyon Complex. The Pahsimeroi Fish Hatchery collects sufficient broodstock to produce 1.0 million of the 1.8 million mitigation smolts. Broodstock collection, spawning, and early incubation are conducted at the Pahsimeroi Fish Hatchery. Final incubation and rearing are conducted at the Niagara Springs Fish Hatchery. All hatchery operations and a portion of monitoring activities are funded by the Idaho Power Company (IPC). Where appropriate, other sources of funding for monitoring activities are identified

1.9 List of program Performance Standards

“Performance Standards” are designed to achieve the program goal/purpose, and are generally measurable, realistic, and time specific. The NPPC “Artificial Production Review” document attached with the instructions for completing the HGMP presents a list of draft “Performance Standards” as examples of standards that could be applied for a hatchery program.

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Upon review of the NPCC “Artificial Production Review” document (2001) we have determined that this document represents the common knowledge up to 2001 and that the utilization of more recent reviews on the standardized methods for evaluation of hatcheries and supplementation at a basin wide ESU scale was warranted.

A NPCC “Artificial Production Review” document (2001) provides categories of standards for evaluating the effectiveness of hatchery programs and the risks they pose to associated natural populations. The categories are as follows: 1) legal mandates, 2) harvest, 3) conservation of wild/naturally produced spawning populations, 4) life history characteristics, 5) genetic characteristics, 6) quality of research activities, 7) artificial production facilities operations, and 8) socio-economic effectiveness. The NPCC standards represent the common knowledge up to 2001.

In a report prepared for Northwest Power and Conservation Council, the Independent Scientific Review Panel (ISRP) and the Independent Scientific Advisory Board (ISAB) reviewed the nature of the demographic, genetic and ecological risks that could be associated with supplementation, and concluded that the current information available was insufficient to provide an adequate assessment of the magnitude of these effects under alternative management scenarios. The ISRP and ISAB recommended that an interagency working group be formed to produce a design(s) for an evaluation of hatchery supplementation applicable at a basin-wide scale. Following on this recommendation, the *Ad Hoc* Supplementation Workgroup (AHSWG) was created and produced a guiding document (Galbreath et al. 2008) that describes framework for integrated hatchery research, monitoring, and evaluation to be evaluated at a basin-wide ESU scale.

The AHSWG framework is structured around three categories of research monitoring and evaluation; 1) implementation and compliance monitoring, 2) hatchery effectiveness monitoring, and 3) uncertainty research. The hatchery effectiveness category addresses regional questions relative to both harvest augmentation and supplementation hatchery programs and defines a set of management objectives for specific supplementation projects. The framework utilizes a common set of standardized performance measures as established by the Collaborative Systemwide Monitoring and Evaluation Project (CSMEP). Adoption of this suite of performance measures and definitions across multiple study designs will facilitate coordinated analysis of findings from regional monitoring and evaluation efforts aimed at addressing management questions and critical uncertainties associated with relationships between harvest augmentation and supplementation hatchery production and ESA listed stock status/recovery.

The NPCC (2006) has called for integration of individual hatchery evaluations into a regional plan. While the RM&E framework in the AHSWG document represents our current knowledge relative to monitoring hatchery programs to assess effects that they have on population and ESU productivity, it represents only a portion of the activities needed to assess how hatcheries are operated throughout the region. A union of the NPCC (2001) hatchery monitoring and evaluation standards and the AHSWG framework likely represents a larger scale more comprehensive set of assessment standards, legal mandates, production and harvest management processes, hatchery operations, and socio-economic standards addressed in the 2001 NPCC document (sections 3.1, 3.2, 3.7, and 3.8 respectively). These are not addressed in the AHSWG framework and should be included in this document. NPCC standards for conservation of wild/natural populations, life history characteristics, genetic characteristics and research activities (sections 3.3, 3.4, 3.5, and 3.6 respectively) are more thoroughly in the AHSWG and the latter standards should apply to this document. Table 1 represents the union of performance standards described by the Northwest Power and Conservation Council (NPCC 2001), regional questions for monitoring and evaluation for harvest and supplementation programs, and performance standards and testable assumptions as described by the Ad Hoc Supplementation Work Group (Galbreath et al. 2008).

Table 1. Compilation of performance standards described by the Northwest Power and Conservation Council (NPCC 2001), regional questions for monitoring and evaluation for harvest and supplementation programs, and performance standards and testable assumptions as described by the Ad Hoc Supplementation Work Group (Galbreath et al. 2008).

Category	Standards	Indicators
1. LEGAL MANDATES	1.1. Program contributes to fulfilling tribal trust responsibility mandates and treaty rights, as described in applicable agreements such as under U.S. v. OR and U.S. v. Washington.	1.1.1. Total number of fish harvested in Tribal fisheries targeting this program. 1.1.2. Total fisher days or proportion of harvestable returns taken in Tribal resident fisheries, by fishery. 1.1.3. Tribal acknowledgement regarding fulfillment of tribal treaty rights.
	1.2. Program contributes to mitigation requirements.	1.2.1. Number of fish released by program, returning, or caught, as applicable to given mitigation requirements.
	1.3. Program addresses ESA responsibilities.	1.3.1. Section 7, Section 10, 4d rule and annual consultation
2. IMPLEMENTATION AND COMPLIANCE	2.1. Program contributes to mitigation requirements.	2.1.1. Hatchery is operated as a segregated program 2.1.2. Hatchery is operated as an integrated program 2.1.3. Hatchery is operated as a conservation program
	2.2. Program addresses ESA responsibilities.	2.2.1. Hatchery fish can be distinguished from natural fish in the hatchery broodstock and among spawners in supplemented or hatchery influenced population(s)
	2.3. Restore and maintain treaty-reserved tribal and non-treaty fisheries.	2.3.1. Hatchery and natural-origin adult returns can be adequately forecasted to guide harvest opportunities. 2.3.2. Hatchery adult returns are produced at a level of abundance adequate to support fisheries in most years with an acceptably limited impact to naturalspawner escapement.
	2.4. Fish for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species.	2.4.1. Number of fish release by location estimated and in compliance with AOPs and US vs. OR Management Agreement. 2.4.2. Number of adult returns by release group harvested 2.4.3. Number of non-target species encountered in fisheries for targeted release group.
	2.5. Hatchery incubation, rearing, and release practices are consistent with current best management practices for the program type.	2.5.1. Juvenile rearing densities and growth rates are monitored and reported. 2.5.2. Numbers of fish per release group are known and reported. 2.5.3. Average size, weight and condition of fish per release group are known and reported. 2.5.4. Date, acclimation period, and release location of each release group are known and reported.
	2.6. Hatchery production, harvest management, and monitoring and evaluation of hatchery production are coordinated among affected co-managers.	2.6.1. Production adheres to planing documents developed by regional co-managers (e.g. US vs. OR Management agreement, AOPs etc.). 2.6.2. Harvest management, harvest sharing agreements, broodstock collection schedules, and disposition of fish trapped at hatcheries in excess of broodstock needs are coordinated among co-management agencies. 2.6.3. Co-managers react adaptively by consensus to monitoring and evaluation results. 2.6.4. Monitoring and evaluation results are reported to regional co-managers in a timely fashion.
3. HATCHERY EFFECTIVENESS MONITORING REGIONAL FOR AUGMENTATION AND SUPPLEMENTATION PROGRAMS	3.1. Release groups are marked in a manner consistent with information needs and protocols for monitoring impacts to natural- and hatchery-origin fish at the targeted life stage(s)(e.g. in juvenile migration corridor, in fisheries, etc.).	3.1.1. All hatchery origin fish recognizable by mark or tag and representative known fraction of each release group marked or tagged uniquely. 3.1.2. Number of unique marks recovered per monitoring stratum sufficient to estimate number of unmarked fish from each release group with desired accuracy and precision.
	3.2. The current status and trends of natural origin populations likely to be impacted by hatchery production are monitored.	3.2.1. Abundance of fish by life stage is monitored annually. 3.2.2. Adult to adult or juvenile to adult survivals are estimated. 3.2.3. Temporal and spatial distribution of adult spawners and rearing juveniles in the freshwater spawning and rearing areas are monitored. 3.2.4. Timing of juvenile outmigration from rearing areas and adult returns to spawning areas are monitored. 3.2.5. Ne and patterns of genetic variability are monitored frequently enough to detect changes across generations.

Category	Standards	Indicators
	3.3. Fish for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species.	3.3.1. Number of fish released by location estimated and in compliance with AOPs and US vs. OR Management Agreement. 3.3.2. Number of adult returns by release group harvested 3.3.3. Number of non-target species encountered in fisheries for targeted release group.
	3.4. Effects of strays from hatchery programs on non-target (unsupplemented and same species) populations remain within acceptable limits.	3.4.1. Strays from a hatchery program (alone, or aggregated with strays from other hatcheries) do not comprise more than 10% of the naturally spawning fish in non-target populations. 3.4.2. Hatchery strays in non-target populations are predominately from in-subbasin releases. 3.4.3. Hatchery strays do not exceed 10% of the abundance of any out-of-basin natural population.
	3.5. Habitat is not a limiting factor for the affected supplemented population at the targeted level of supplementation.	3.5.1. Temporal and spatial trends in habitat capacity relative to spawning and rearing for target population. 3.5.2. Spatial and temporal trends among adult spawners and rearing juvenile fish in the available habitat.
	3.6. Supplementation of natural population with hatchery origin production does not negatively impact the viability of the target population.	3.6.1. Pre- and post-supplementation trends in abundance of fish by life stage is monitored annually. 3.6.2. Pre- and post-supplementation trends in adult to adult or juvenile to adult survivals are estimated. 3.6.3. Temporal and spatial distribution of natural origin and hatchery origin adult spawners and rearing juveniles in the freshwater spawning and rearing areas are monitored. 3.6.4. Timing of juvenile outmigrations from rearing area and adult returns to spawning areas are monitored.
	3.7. Natural production of target population is maintained or enhanced by supplementation.	3.7.1. Adult progeny per parent (P:P) ratios for hatchery-produced fish significantly exceed those of natural-origin fish. 3.7.2. Natural spawning success of hatchery-origin fish must be similar to that of natural-origin fish. 3.7.3. Temporal and spatial distribution of hatchery-origin spawners in nature is similar to that of natural-origin fish. 3.7.4. Productivity of a supplemented population is similar to the natural productivity of the population had it not been supplemented (adjusted for density dependence). 3.7.5. Post-release life stage-specific survival is similar between hatchery and natural-origin population components.
	3.8. Life history characteristics and patterns of genetic diversity and variation within and among natural populations are similar and do not change significantly as a result of hatchery augmentation or supplementation programs.	3.8.1. Adult life history characteristics in supplemented or hatchery influenced populations remain similar to characteristics observed in the natural population prior to hatchery influence. 3.8.2. Juvenile life history characteristics in supplemented or hatchery influenced populations remain similar to characteristics in the natural population those prior to hatchery influence. 3.8.3. Genetic characteristics of the supplemented population remain similar (or improved) to the unsupplemented populations.
	3.9. Operate hatchery programs so that life history characteristics and genetic diversity of hatchery fish mimic natural fish.	3.9.1. Genetic characteristics of hatchery-origin fish are similar to natural-origin fish. 3.9.2. Life history characteristics of hatchery-origin adult fish are similar to natural-origin fish. 3.9.3. Juvenile emigration timing and survival differences between hatchery and natural-origin fish are minimized.
	3.10. The distribution and incidence of diseases, parasites and pathogens in natural populations and hatchery populations are known and releases of hatchery fish are designed to minimize potential spread or amplification of diseases, parasites, or pathogens among natural populations.	3.10. Detectable changes in rate of occurrence and spatial distribution of disease, parasite, or pathogen among the affected hatchery and natural populations.

Category	Standards	Indicators
4. OPERATION OF ARTIFICIAL PRODUCTION FACILITIES	4.1. Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols such as those described by IHOT, PNFHPC, the Co-Managers of Washington Fish Health Policy, INAD, and MDFWP.	4.1.1. Annual reports indicating level of compliance with applicable standards and criteria. 4.1.2. Periodic audits indicating level of compliance with applicable standards and criteria.
	4.2. Effluent from artificial production facility will not detrimentally affect natural populations.	4.2.1. Discharge water quality compared to applicable water quality standards and guidelines, such as those described or required by NPDES, IHOT, PNFHPC, and Co-Managers of Washington Fish Health Policy tribal water quality plans, including those relating to temperature, nutrient loading, chemicals, etc.
	4.3. Water withdrawals and instream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	4.3.1. Water withdrawals compared to applicable passage criteria. 4.3.2. Water withdrawals compared to NMFS, USFWS, and WDFW juvenile screening criteria. 4.3.3. Number of adult fish aggregating and/or spawning immediately below water intake point. 4.3.4. Number of adult fish passing water intake point. 4.3.5. Proportion of diversion of total stream flow between intake and outfall.
	4.4. Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens.	4.4.1. Certification of juvenile fish health immediately prior to release, including pathogens present and their virulence. 4.4.2. Juvenile densities during artificial rearing. 4.4.3. Samples of natural populations for disease occurrence before and after artificial production releases.
	4.5. Any distribution of carcasses or other products for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines, including state, tribal, and federal carcass distribution guidelines.	4.5.1. Number and location(s) of carcasses or other products distributed for nutrient enrichment. 4.5.2. Statement of compliance with applicable regulations and guidelines.
	4.6. Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally produced population.	4.6.1. Spatial and temporal spawning distribution of natural population above and below weir/trap, currently and compared to historic distribution.
	4.7. Weir/trap operations do not result in significant stress, injury, or mortality in natural populations.	4.7.1. Mortality rates in trap. 4.7.2. Prespawning mortality rates of trapped fish in hatchery or after release.
	4.8. Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish.	4.8.1. Size at, and time of, release of juvenile fish, compared to size and timing of natural fish present. 4.8.2. Number of fish in stomachs of sampled artificially produced fish, with estimate of natural fish composition.
5. SOCIO-ECONOMIC EFFECTIVENESS	5.1. Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population.	5.1.1. Total cost of program operation. 5.1.2. Sum of ex-vessel value of commercial catch adjusted appropriately, appropriate monetary value of recreational effort, and other fishery related financial benefits.
	5.2. Juvenile production costs are comparable to or less than other regional programs designed for similar objectives.	5.2.1. Total cost of program operation. 5.2.2. Average total cost of activities with similar objectives.
	5.3. Non-monetary societal benefits for which the program is designed are achieved.	5.3.1. Number of adult fish available for tribal ceremonial use. 5.3.2. Recreational fishery angler days, length of seasons, and number of licenses purchased.

1.11 EXPECTED SIZE OF PROGRAM

1.11.1 Proposed annual broodstock collection level (maximum number of adult fish)

IPC's overall mitigation goal for summer steelhead is to produce 400,000 pounds of smolts annually. Within the

Pahsimeroi River, IPC is required by the Hells Canyon Settlement Agreement (HCSA) to collect a sufficient number of adult steelhead to provide for the annual production of 200,000 pounds of steelhead smolts (approximately 900,000 fish). However, Section IV.A.3.f of the HCSA allows the fisheries agencies to deviate from this schedule. Current management objectives developed by IDFG call for the release of 800,000 (177,777 lbs) steelhead smolts into the Pahsimeroi River annually. The annual broodstock collection levels needed to meet this release includes 220 pairs of adults based on average fecundity and in-hatchery survival.

In addition to broodstock collected to fulfill the HCSA requirements mentioned above, additional Pahsimeroi stock hatchery-origin broodstock, that is not part of IPC mitigation, is collected to provide the following production:

500,000 eyed-eggs to the Shoshone Bannock Tribes' streamside incubator programs in Panther Creek and Indian Creek (approximately 125 pairs of adults). This production is covered under a separate HGMP and is stipulated in the 2018-2027 US vs. OR Management Agreement.

186,000 smolts as part of the LSRCP mitigation reared at Magic Valley Fish Hatchery and released into the Little Salmon River (approximately 55 pairs of adults). This release is covered under a separate HGMP.

1.11.2 Proposed annual fish release levels (maximum number) by life stage and location

The proposed annual release level in Table 2 below reflects the release level and location. Currently, 800,000 smolts are released at the Pahsimeroi Fish Hatchery directly downstream of the hatchery weir. A summary of the actual numbers of smolts released into the Pahsimeroi River for the last 23 years is provided in Section 10.3.

Table 2. Annual smolt releases from the Pahsimeroi Fish Hatchery by life stage and location.

Life Stage	Release Location	Annual Release Level
Yearling	Pahsimeroi River	800,000 fish (approx 177,777 lbs at 4.5 fpp)

1.12 CURRENT PROGRAM PERFORMANCE, INCLUDING ESTIMATED SMOLT-TO-ADULT SURVIVAL RATES, ADULT PRODUCTION LEVELS, AND ESCAPEMENT LEVELS. INDICATE THE SOURCE OF THESE DATA.

The most recent performance data for Pahsimeroi A-run steelhead reared at NSFH and released in the Pahsimeroi River is presented in Table 3 below. This information is based on adults trapped at the Pahsimeroi weir and recovered in sport fisheries in Idaho.

Table 3. Smolt-to-adult (SAR) survival rates for hatchery produced Pahsimeroi A-run summer steelhead smolts reared at Niagara Springs Fish Hatchery and released as smolts at the Pahsimeroi Fish Hatchery weir.

Brood Year	Release Year	Number of Smolts Released from NSFH	Return Years	Estimated Return to LGD	SAR
1994	1995	829,277	97,98	7,497	0.90%
1995	1996	799,220	98,99	7,891	0.99%

1996	1997	830,654	99,00	3,502	0.42%
1997	1998	801,541	00,01	5,831	0.73%
1998	1999	829,199	01,02	7,630	0.92%
1999	2000	830,316	02,03	20,355	2.45%
2000	2001	889,955	03,04	8,892	1.00%
2001	2002	836,713	04,05	12,067	1.44%
2002	2003	843,257	05,06	10,604	1.26%
2003	2004	840,177	06,07	10,158	1.21%
2004	2005	820,667	07,08	10,314	1.26%
2005	2006	828,883	08,09	17,381	2.10%
2006	2007	830,447	09,10	17,043	2.05%
2007	2008	838,419	10,11	43,084	5.14%
2008	2009	825,525	11,12	15,253	1.85%
2009	2010	832,907	12,13	17,587	2.11%
2010	2011	819,853	13,14	8,138	0.99%
2011	2012	807,960	14,15	12,789	1.58%
10yr Average					**1.95%**
10yr Geometric Mean					**1.74%**

Source: IDFG unpublished data

1.13 Date Program Started (Years in Operation), or is Expected to Start

Pahsimeroi Fish Hatchery – The Upper PFH was constructed in 1966 as an acclimation facility for summer steelhead smolts that were transported from NSFH and eventually released into the Pahsimeroi River. This occurred from 1967 through 1971 until IDFG determined that directly released steelhead smolts survived as well or better than acclimated smolts. Since then, all steelhead smolts have been directly released into the Pahsimeroi River immediately below the adult barrier weir at the lower PFH. IPC constructed the lower PFH in 1968 along the lower Pahsimeroi River approximately 1.6 kilometers above its confluence with the mainstem Salmon River. Steelhead trapping and spawning at the lower PFH began in 1969, with the first returns of NSFH smolts released in 1967.

Niagara Springs Fish Hatchery – NSFH was constructed in 1966 with the expressed goal of producing 200,000 pounds of steelhead smolts annually. The first year class of fish spawned at Oxbow Fish Hatchery and reared at NSFH were released into the Pahsimeroi River in the spring of 1967. Following the signing of the HCSA in 1980, steelhead production goals at NSFH increased from 200,000 to 400,000 pounds of fish annually.

1.14 Expected Duration of Program

This summer steelhead program is expected to continue indefinitely to mitigate for losses of anadromous fish associated with the construction and ongoing operation of the Hells Canyon Complex.

1.15 WATERSHEDS TARGETED BY PROGRAM

Listed by hydrologic unit code –
Pahsimeroi River: 17060202
Snake River at NSFH: 17040212

1.16 INDICATE ALTERNATIVE ACTIONS CONSIDERED FOR ATTAINING PROGRAM GOALS, AND REASONS WHY THOSE ACTIONS ARE NOT BEING PROPOSED

IDFG has not considered alternative actions for obtaining program goals. Stated goals are mandated by the Federal Energy Regulatory Commission (FERC) through the HCSA with IPC.

SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS

2.1 LIST ALL ESA PERMITS OR AUTHORIZATIONS IN HAND FOR THE HATCHERY PROGRAM

- Section 7(a)(2) Biological Opinion. Consultation Number WCR-20177282. Issued December 2017

2.2 PROVIDE DESCRIPTIONS, STATUS, AND PROJECTED TAKE ACTIONS AND LEVELS FOR NMFS ESA-LISTED NATURAL POPULATIONS IN THE TARGET AREA

2.2.1 DESCRIPTION OF NMFS ESA-LISTED SALMONID POPULATION(S) AFFECTED BY THE PROGRAM

Populations affected by this program are described in a report prepared by the ICTRT (2005). This section is summarized from that publication.

The Snake River Basin steelhead ESU extends throughout the Snake River drainage system, including tributaries in southwest Washington, eastern Oregon, and north/central Idaho. Snake River steelhead migrate a substantial distance from the ocean (up to 1,500 km) and use high-elevation tributaries (typically 1,000–2,000 meters above sea level) for spawning and juvenile rearing. They occupy habitat that is considerably warmer and drier (on an annual basis) than other steelhead ESUs. Snake River Basin steelhead are generally classified as summer run, based on their adult run-timing patterns. They enter the Columbia River from late June to October and after holding over the winter, spawn the following spring (March to May). Managers classify upriver summer steelhead runs into two groups based primarily on ocean age and adult size on return to the Columbia River: A-run steelhead are predominantly 1-ocean fish, while B-run steelhead are larger, predominated by 2-ocean fish.

With the exception of the Tucannon River and some small tributaries to the mainstem Snake River, the tributary habitat used by the Snake River Basin steelhead ESU is above Lower Granite Dam. Major groupings of populations and subpopulations can be found in 1) the Grande Ronde River system; 2) the Imnaha River drainage; 3) the Clearwater River drainages; 4) the South Fork Salmon River; 5) the smaller mainstem tributaries before the confluence of the mainstem Snake River; 6) the Middle Fork Salmon River, 7) the Lemhi and Pahsimeroi rivers, and 8) upper Salmon River tributaries.

The ICTRT has identified three major spawning areas (MaSA) and two minor spawning areas (MiSA) within reaches used by Pahsimeroi summer steelhead. The Lemhi population occupies reaches that include three MaSAs and two MiSAs identified by the ICTRT (ICTRT 2005).

Identify the NMFS ESA-listed population(s) that will be directly affected by the program. (Includes listed fish used in supplementation programs or other programs that involve integration of a listed natural population. Identify the natural population targeted for integration).

The Pahsimeroi River hatchery steelhead program is a segregated harvest program. No listed natural-origin fish are used in the broodstock. The operation of the hatcheries described in this HGMP is expected to have no direct effect on ESA-listed species.

Identify the NMFS ESA-listed population(s) that may be incidentally affected by the program

While no direct effects to ESA listed species is expected, it is possible that there are indirect effects from this hatchery program on the Pahsimeroi River population and populations downstream of the Pahsimeroi. This list includes ESA-listed fish in target hatchery fish release, adult return, and broodstock collection areas.

- Snake River Spring/Summer-run Chinook salmon ESU (T – 4/92)
- Snake River sockeye salmon ESU (E – 11/91)
- Snake River Basin steelhead ESU (T – 8/97)

Assess the level of risk that the hatchery program has on the natural population (criteria based on Appendix C of the NOAA Fisheries- Supplemental Comprehensive Analysis (SCA))

Abundance: Maintaining a segregated broodstock will prevent the need to remove natural-origin adults for use as broodstock. There is no evidence for delays or blocking of upstream migration due to operation of the adult weir and trap. Since 1996, no mortalities of natural-origin adult steelhead have been observed as a direct result of trapping and handling.

Productivity: Hatchery-origin fish are not passed above the hatchery weir to spawn naturally thus reducing risk associated with reduction if fitness due to interbreeding of hatchery- and natural-origin fish.

Spatial Structure: Operation of this hatchery program is not expected to negatively affect spatial distribution of natural-origin spawners. No evidence of delay of blockage of migration associated with operation of the hatchery weir and trap has been observed.

Previous genetic analyses indicate low genetic differentiation between hatchery and wild adults returning to the Pahsimeroi River weir (IDFG, unpublished data). There is evidence that introgression from stocked hatchery steelhead (Pahsimeroi and Sawtooth) has occurred throughout the upper Salmon River and that many wild populations in these area exhibit little to no genetic differentiation from these hatchery populations (Nielsen et al. 2009).

There is anecdotal evidence that the resident *O. mykiss* population in the Pahsimeroi River has received introgression from stocked hatchery rainbow trout of "coastal" origin. This is based on evidence of introgression in *O. mykiss* populations in the Lemhi River (IDFG unpublished data) and genetic similarities between *O. mykiss* samples collected from the Lemhi River and Pahsimeroi River (Nielsen et al. 2009). Current management guidelines are to prevent hatchery adults from passing upstream of the Pahsimeroi weir and to assess straying of Pahsimeroi hatchery adults in the upper Salmon River basin through the operation of weirs and parentage based tagging (PBT) technology.

2.2.2 Status of NMFS ESA-listed salmonid population(s) affected by the program

Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds (see definitions in "Attachment 1")

Pahsimeroi steelhead are part of the Snake River Steelhead DPS. The DPS contains both A-and B-run steelhead. This population is an "A" run and is classified as threatened under the Endangered Species Act. The ICTRT classified this population as "intermediate." An "intermediate" population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.15 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT (HSRG 2009).

For Snake River steelhead "A" run populations lacking in direct abundance and productivity data, the ICTRT developed preliminary estimates representing an average population of this run type using Lower Granite Dam natural-origin fish counts. The 10-year geometric mean number of natural spawners was 556 fish and the adjusted productivity was 1.86 recruits per spawner (ICTRT 2009).

Provide the most recent 12 year progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population.

Estimated recruits per spawner for the area upstream of the Pahsimeroi Fish Hatchery weir for brood years 2004-2009 ranged from 0.8 to 9.8 with a mean of 4.4 (Stark et. al. 2016).

Provide the most recent 12 year annual spawning abundance estimates, or any other abundance information. Indicate the source of these data. (Include estimates of juvenile habitat seeding relative to capacity or natural fish densities, if available).

The numbers of natural-origin steelhead trapped at the Pahsimeroi Fish Hatchery weir are presented in Table 4 below. All natural-origin steelhead are passed above the weir to spawn naturally.

Table 4. Number of natural-origin steelhead captured at the Pahsimeroi Hatchery weir 1992-2017.

Trap year	Adults Trapped
1992	39
1993	24
1994	35
1995	17
1996	17
1997	25

1998	49
1999	38
2000	58
2001	133
2002	378
2003	181
2004	67
2005	42
2006	68
2007	22
2008	45
2009	30
2010	157
2011	239
2012	285
2013	178
2014	206
2015	130
2016	92
2017	25

Source:IDFG unpublished data

Provide the most recent 12 year estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

The weir on the Pahsimeroi River is located approximately 1.6 kilometers upstream of the confluence with the mainstem Salmon River, providing little opportunity for natural spawning below the weir. Weir management includes releasing all natural-origin steelhead above the weir and not allowing any hatchery-origin adults above the weir. It is assumed that steelhead on the spawning grounds above the weir are exclusively natural-origin.

2.2.3 Describe hatchery activities, including associated monitoring and evaluation and research programs that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take.

Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the take may occur, the risk potential for their occurrence, and the likely effects of the take.

ESA-listed, A-run steelhead are handled during broodstock collections at Pahsimeroi Fish Hatchery. All natural-origin adults are passed upstream with a minimum of delay and handling. Incidental take of ESA- listed Snake River Chinook salmon is unlikely during steelhead broodstock collection which occurs from February through mid-May. Neither adult spring/summer Chinook nor sockeye salmon are usually present in the upper Salmon River until mid-May or later (Sankovich and Bjornn 1992). Therefore, we believe there will be no adverse effects from broodstock collection at the hatchery weir. The number of natural-origin steelhead captured at the hatchery weir is displayed in Table 4 (Section2.2.2). Anticipated take resulting from broodstock collection is listed in Appendix A; Table 1.

Pahsimeroi Fish Hatchery Programmatic Maintenance

Activities are described below but because take associated with these activities is not associated with a particular species at Pahsimeroi Fish Hatchery, the anticipated take for these activities is reported in Appendix A; Table A2 of the Pahsimeroi Chinook salmon HGMP.

Programmatic Maintenance*:* The Pahsimeroi River flows through a valley which is heavily influenced by livestock and agricultural activity. The river transports and deposits large amounts of sediment which can hamper normal hatchery operation. As such, in-river maintenance of the hatchery diversion dams and intake structures, intake canals, adult fish weir and fish ladder is common. A description of each maintenance task follows.

Hatchery Diversion Dam and Water Source Intake*:* The wooden, steel and concrete structures which constitute the diversion dam and water source intake at both the upper and lower Pahsimeroi Hatchery sites may become compromised simply from age and exposure to changing weather conditions. Hatchery personnel must periodically complete a visual inspection of the structures by entering the river channel with hip boots or waders. Minor repairs such as stoplog replacement may be completed in place by workers using hand tools, while more extensive repairs may require portions of these structures to be temporarily removed for repair or replacement. Should removal of these structures be necessary, a crane or similar lifting device would be employed and operated from the bank of the stream. Heavy equipment will not enter the stream channel. In some instances it may be necessary to construct a small cofferdam to isolate the work area from the river to facilitate repair work. Cofferdams would be constructed from sheet piling or ecology blocks lined with heavy mil plastic sheeting, thereby reducing the potential for sediment to escape and be transported downstream.

Throughout the year, gravel and sediment along with small woody debris is deposited in the vicinity of the hatchery diversion dams and water supply intake structures at both the upper and lower Pahsimeroi Hatchery sites. This accumulation of sediment and debris has the potential to restrict the volume of water that can be diverted to the hatchery. Materials must be removed annually to ensure an uninterrupted supply of water for fish culture operation. The diversion dams and water source intake structures may become damaged by the seasonal movement and deposition of sediment and large woody debris. These structures may need to be temporarily removed for repair or replacement.

Removal of accumulated sediment or woody debris may be accomplished using a variety of techniques ranging from a clam shell type excavation bucket mounted to a crane, to a tracked or rubber tired excavator. In all cases excavation equipment will not enter the stream channel. Access within the wetted perimeter of the stream will be limited to workers using hand tools or guiding the operation of the heavy equipment. In some instances it may be desirable to construct small cofferdams using ecology blocks lined with heavy mil plastic sheeting to isolate the work area from the river channel, thereby reducing the potential for sediment to escape and be transported downstream.

The diversion dams and water source intakes are located within the migration and spawning habitat of ESA listed summer Chinook salmon and steelhead. A small number of listed bull trout have also been observed migrating through this section of the Pahsimeroi River. Direct effects to individual adult or juvenile summer Chinook salmon, steelhead and bull trout are a concern during all in-river maintenance activities. Effects could include disturbance and displacement of fish as a result of personnel or heavy equipment working near the river channel. A small sediment plume will likely be created as a result of substrate disturbance. This plume will persist for a short distance downstream and could affect embryonic life stages of Chinook salmon and steelhead. To minimize impacts to incubating Chinook salmon or steelhead, all work will be completed whenever possible within a work window of July 1 (post- steelhead fry emergence) to August 15 (pre-Chinook salmon spawning) previously established by NOAA Fisheries for similar construction projects within the vicinity of the Pahsimeroi Hatchery (HDR/Fishpro 2005). Should isolation of the work area with cofferdams also involve dewatering, hatchery personnel would electrofish the site to capture and relocate any listed species present within the coffered work zone. All excavated material will be removed from the river and loaded into a truck for off-site disposal.

Water Source Intake Canals and Fish Bypass Screens: Just as gravel, sediment, and small woody debris is deposited in the vicinity of river water intake structures at the upper and lower hatchery sites, similar material is deposited within the canals that deliver surface water to the various fish culture containers. This accumulation of sediment and debris has the potential to restrict the flow of water diverted to the hatchery and interfere with the operation of fish bypass screens and pipes designed to protect natural origin salmon and steelhead from entrainment into the hatchery. Materials must be removed annually to ensure an uninterrupted supply of water for fish culture operation. Removal of accumulated sediment or woody debris is accomplished using a bulldozer to move material to an excavator positioned on the canal bank. The excavator can remove material from the canals and deposit it on site or in transport vehicles for offsite disposal.

The two fish bypass screens and associated pipes located within the river water intake canals also require annual maintenance. This involves removing the screens for inspection and repair of seals, drive sprockets, chains and bearings, as well as lubrication of moving parts.

Both of the maintenance activities described here can be completed when the hatchery facility is out of operation. To limit potential impact to listed species, slide gates can be closed and the intake canal dewatered and isolated from the river channel before any maintenance work commences. Chinook salmon, steelhead or bull trout that may be present in the vicinity of the hatchery are not disturbed by this maintenance activity. Further, sediment generated from this activity is not discharged to the river where it could impact embryonic life stages. To minimize impacts to the small number of listed species that may inhabit the water source intake canals, hatchery personnel will electrofish the canal during the dewatering process to capture and safely release all fish to the Pahsimeroi River.

Should the bypass pipes which return entrained fish to the river become plugged with sediment or woody debris, they may require cleaning with high pressure water nozzles. Unlike other maintenance described in this section, this activity does result in some sediment and woody debris being flushed directly into the river channel. A small sediment plume will likely be created as a result of sediment discharge. The volume of material flushed from the pipe is expected to be less than ¼ cubic yard of material. A sediment plume will be created that will persist for a short distance downstream and could affect embryonic life stages of Chinook salmon and steelhead. By necessity, work will be completed in the spring (during steelhead egg incubation) and in the fall (during Chinook salmon egg incubation). While the actions described here have potential to affect embryonic life stages of Chinook salmon and steelhead, the frequency (once every 5-10 years), duration (1 hour) and magnitude (less than ¼ cubic yard of material moved, sediment plume persisting for less than 50 yards downstream) of the action is thought to be insignificant.

Adult Fish Weir: Following periods of high flow, sand and gravel accumulates in front of the adult fish weir and entrance to the fish ladder and trap used for capturing adult summer Chinook salmon and steelhead returning to the hatchery. This gravel accumulation restricts river flow and may encourage bank erosion, resulting in further sedimentation or damage to hatchery structures and equipment.

Removal of accumulated sediment or woody debris may be accomplished using a variety of techniques ranging from a clam shell type excavation bucket mounted to a crane, to a tracked or rubber tired excavator. In all cases, excavation equipment will not enter the stream channel. Access within the wetted perimeter of the stream will be limited to workers guiding the operation of the crane or excavator. Excavated material will be loaded into a truck and hauled off site for disposal. A small, short duration, sediment plume is anticipated during the excavation process. The adult fish trap and fish ladder is located within the migration corridor of summer Chinook salmon, steelhead and bull trout.

Aside from damages or loss of functionality related to high water events, the integrity of the adult weir may be compromised simply by age and exposure to changing weather conditions. Hatchery personnel must periodically complete a visual inspection of the structures by entering the river channel with hip boots or waders. Minor repairs may be completed in place by workers using hand tools, while more extensive repairs may require individual weir panels to be temporarily removed for repair or replacement. Should removal of these structures exceed the lifting capability of hatchery personnel, a crane or similar device operated from the stream bank would be employed. Heavy equipment will not enter the stream channel. In some instances it may be necessary to construct a small cofferdam to isolate the work area from the river to facilitate repair work. Cofferdams would be constructed from sheet piling or ecology blocks lined with heavy mil plastic sheeting, thereby reducing the potential for sediment to escape and be transported downstream.

Direct effects to individual adult or juvenile summer Chinook salmon, steelhead and bull trout are a concern during these maintenance activities. Effects could include disturbance and displacement of fish as a result of personnel or heavy equipment working near the river channel. To minimize potential impacts to embryonic life stages of Chinook salmon or steelhead, all work will be completed between July 1 (after steelhead fry emergence) and August 15 (before Chinook salmon spawning) previously established by NOAA Fisheries for similar construction projects within the vicinity of the Pahsimeroi Hatchery (HDR/Fishpro 2005). No machinery is placed in the river channel, thus eliminating any risk of fuel or oil contamination. The removal of materials as described herein may occur as frequently as once each year depending upon the magnitude of spring runoff. Should isolation of the work area with cofferdams also involve dewatering, hatchery personnel would electrofish the site to capture any listed species present within the coffered work zone and release them safely to the Pahsimeroi River.

River Bank Stabilization: While infrequent, extreme high runoff events have the potential to erode the stream bank in the vicinity of the hatchery causing localized flooding, damage to hatchery buildings or the interruption of water supplied to the hatchery. To respond to threats of this nature it may be necessary to place fill material or rip rap within the river channel to control bank erosion. All materials used in such efforts would be clean (washed) rock to limit the introduction of sediment to the river channel. Machinery used for rock placement would be operated from outside the wetted perimeter of the stream to avoid the possibility of fuel or oil entering the water. Direct effects to individual adult or juvenile spring Chinook salmon, steelhead and bull trout would be a concern during these maintenance activities. Effects could include disturbance and displacement of fish as a result of personnel or heavy equipment working near the river channel. At certain times of year impacts to embryonic life stages resulting from stream bank stabilization activities are also a concern; however, considering that such stabilizations activities would likely be done in response to extreme high river flows and localized flooding, the turbidity generated from the action would likely be less than what is already present in the river.

NIAGARA SPRINGS FISH HATCHERY

Programmatic Maintenance: NSFH is located on the north bank of the Snake River Canyon in south central Idaho. Spring water for hatchery operation is captured as it flows from the basalt cliffs of the canyon wall. The various wooden, steel, and concrete structures which constitute the diversion dam and water source intake structures may become compromised simply from age and exposure to changing weather conditions or from unique storm events. A description of possible maintenance activities follows.

Incubation, Fire Suppression, and Irrigation Water Intake Structure: The steelhead egg incubation system, fire suppression system, and irrigation system are all supplied with spring water diverted from Niagara Spring. Water is collected high on the basalt talus slope above the hatchery and delivered via gravity flow to the hatchery in a 6-inch-diameter pipe. Due to the steepness of the slope, the natural downward movement of rock within the spring can occasionally obstruct the flow of water into the collection box. Once each spring, prior to the onset of steelhead egg incubation, hatchery personnel must inspect the spring water source and remove any rocks or vegetation that are restricting the flow of water to the hatchery collection box. The Bliss Rapids Snail (*Taylorconcha serpenticola*) is known to inhabit adjacent areas of Niagara Spring. However, biological assessments performed by IPC in 2005 (Stephenson 2005) concluded that Bliss Rapid Snail do not inhabit the upper Niagara Spring in the vicinity of the spring water collection box due to high water velocity. Therefore, annual maintenance of the water diversion structure will have no direct effect to Bliss Rapids Snail. No equipment or machinery will be used to remove rocks or vegetation from the collection box area, thus there is no risk of contamination from petroleum products. Chinook salmon and steelhead do not inhabit the Niagara Springs.

Incubation, Fire Suppression, and Irrigation Water Pipeline: As described above, spring water collected high on the basalt slope of Niagara Springs is delivered to the hatchery via a 6 inch diameter steel pipeline. The pipeline is partially buried and partially exposed along its course through upland habitat from the collection box to the main hatchery building. Deterioration from rust and corrosion or damage from falling rock requires infrequent repair or maintenance in the form of repair (i.e. patching/welding) or replacement of damaged sections of pipe. Such maintenance is expected to occur every 5 to 10 years. A survey by IPC personnel conducted on April 10, 2008 found that Bliss Rapids snails occur in low densities downhill of the pipeline (approximately 20-30 feet) and that higher densities of this snail occur further downstream within Niagara Springs. Pipeline maintenance activities would all occur in an upland portion of the property where no snails or snail habitat exists. There is a 20 - 30 foot vegetated buffer between the pipeline location and Niagara Springs. Stephenson (2008) concluded that work of this nature will have no affect on any listed species. Chinook salmon and steelhead do not inhabit the Niagara Springs.

Incubation Water Intake Structure: The incubation water is supplied with spring water diverted from Niagara Spring. As described above the water is collected high on the basalt talus slope above the hatchery and delivered via gravity flow to the hatchery building. The water is collected via an intake canal and then diverted through a filter building. The spring water is filtered through four 40 micron rotating drums to remove debris and then delivered to the hatchery building through a 24 inch metal pipe lined with concrete. Once it reaches the hatchery building the water flows through three Ultra Violet vessels where the water is disinfected prior to entering the upwelling incubators and early rearing vats.

Raceway Water Intake Structure: The steelhead rearing raceways at Niagara Springs Hatchery are also supplied with spring water diverted from Niagara Spring. In the case of the raceways, water is diverted from a man-made pool near the main discharge of the spring. As much as 120 cfs of water is diverted to the hatchery via a 48 inch diameter concrete reinforced pipe. The water passes through two rotating traveling screens to remove debris such as leaves, algae, and Chinese elm seeds prior to entering the 48 inch diameter pipe. The rotating traveling screens require annual and periodic maintenance which is done by the Idaho Power Maintenance crew located in Hagerman, ID. Rimview Trout Hatchery receives effluent water from Niagara Springs Hatchery through the effluent canal which is equipped with a rotating traveling screen. They receive 40 cfs of effluent water from December through March. This rotating traveling screens also requires periodic maintenance by IPC. Periodic maintenance of the water intake structure including the trash rack, control gate, and discharge weir located within the spring pool is necessary to ensure adequate flow of water to the hatchery. Hatchery personnel must periodically complete a visual inspection of the structures by entering the diversion pool with hip boots or waders. Minor repairs may be completed in place by workers using hand tools, while more extensive repairs may require certain structural components to be temporarily removed for repair or replacement. Should removal of these structures exceed the lifting capability of hatchery personnel, a crane or similar device operated from the stream bank would be employed. Heavy equipment will not enter the spring water diversion pool. In some instances it may be necessary to construct a small cofferdam to isolate the work area from the river to facilitate repair work. Cofferdams would most likely be constructed from sheet piling to reduce the potential for sediment to escape and be transported downstream. Bliss Rapids Snail (*Taylorconcha serpenticola*) is known to inhabit Niagara Spring, and may be present in the vicinity of these hatchery structures. Direct effects to listed snails are a concern during all in-water maintenance activities. Effects could include disturbance or crushing of individual snails resulting from personnel working in the water, or disturbance of substrate resulting from heavy machinery removing/replacing portions of the hatchery structures. Sediment liberated from in-water activity may also create a small sediment plume downstream of the work site for a limited time. Impacts to listed snails from routine hatchery maintenance work are believed to be short term in nature; lasting only 1-2 days. Bliss Rapids snails are known to recolonize disturbed or dewatered habitat within days. Chinook salmon and steelhead do not inhabit the Niagara Springs.

Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

The number of listed natural-origin adults captured at the Pahsimeroi Fish Hatchery weir is listed in Table 4 (Section 2.2.2). All fish were released above the weir to spawn naturally. No natural-origin adults have been killed as a direct result of the trapping operation since steelhead were listed in 1997.

Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

All adult steelhead (hatchery- and natural-origin) are trapped and handled at the Pahsimeroi Fish Hatchery weir. The numbers of natural-origin adults trapped varies annually (Section 2.2.2, Table 4). All natural-origin adults are passed upstream for spawning. Following capture, natural-origin fish may be marked and tissue sampled before release. See Appendix A; Table 1. Take of listed hatchery-origin steelhead (Dworshak stock) occurs concurrently with broodstock collection for the Pahsimeroi A-run program. Take for these steelhead is included in the Salmon River B-run steelhead HGMP.

Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

It is unlikely that take levels for natural A-run steelhead will exceed projected take levels presented in Appendix A, Table 1. However, in the unlikely event that this occurs, the IDFG will consult with NMFS Sustainable Fisheries Division or Protected Resource Division staff and agree to an action plan. We assume that any contingency plan will include a provision to discontinue hatchery-origin steelhead trapping activities.

SECTION 3 RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1 DESCRIBE ALIGNMENT OF THE HATCHERY PROGRAM WITH ANY ESU-WIDE HATCHERY PLAN OR OTHER REGIONALLY ACCEPTED POLICIES. EXPLAIN ANY PROPOSED DEVIATIONS FROM THE PLAN OR POLICIES.

This program conforms to the provisions of the Hells Canyon Settlement Agreement (HCSA) to mitigate for adult steelhead lost due to the construction and ongoing operation of the Hells Canyon Complex. The HCSA stipulates that enough summer steelhead adults should be trapped and spawned at PFH to permit the annual production of

200,000 pounds of Pahsimeroi A-run summer steelhead smolts at NSFH.

3.2 List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates. Indicate whether this HGMP is consistent with these plans and commitments, and explain any discrepancies.

2018-2027 Management Agreement for Upper Columbia River Fall Chinook, Steelhead and Coho pursuant to United States of America v. State of Oregon, U.S. District Court, District of Oregon.

The Pahsimeroi River release is not part of this management agreement but releases from Niagara Springs Fish Hatchery into the Snake and Little Salmon rivers are part of the agreement.

3.3 Relationship to harvest objectives

Managers operate the Pahsimeroi steelhead hatchery program to maximize benefits in the form of harvest mitigation. As part of its harvest management and monitoring program, managers conduct annual creel and angler surveys to assess the contribution that program fish make towards these harvest objectives.

The Hells Canyon Settlement Agreement defined mitigation goals in terms of smolts released. State and Tribal co-operators have established near and long term expectations for adult returns to Idaho Power facilities based on the smolt to adult return rates used to size the production capacity of the LSRCP hatcheries. State, tribal and federal cooperators work to develop annual production and mark plans that are consistent with original LSRCP and Hells Canyon Settlement Agreement, the US vs. OR Management Agreement, and recommendations of the HSRG and HRT relative to ESA impact constraints, genetics, fish health and fish culture concerns.

In the Snake River basin, mitigation hatchery returns are harvested in both mainstem and tributary terminal fisheries. Fish that return in excess to broodstock needs for the hatchery programs are shared equally between sport and Tribal fisheries. State and Tribal co-operators manage fisheries to maximize harvest of hatchery returns that are in excess of broodstock needs. Fisheries are managed temporally and spatially to: minimize impacts to non-target natural returns and comply with ESA incidental take limits; achieve hatchery broodstock goals; achieve sharing objectives among Tribal and recreational fisheries; optimize the quantity and quality of fish harvested that are in excess of what is needed to meet broodstock needs; maximize temporal and spatial extent of fishing opportunities; and minimize conflicts between different gear types and user groups.

3.3.1 Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years, if available. Also provide estimated future harvest rates on fish propagated by the program, and on listed fish that may be taken while harvesting program fish.

Steelhead released as part of the Pahsimeroi Fish Hatchery steelhead program contribute to sport, commercial and tribal fisheries in the Columbia, Snake, and Salmon rivers. Estimated harvest rates for sport fisheries in Idaho are presented in Table 5.

Table 5. Estimated steelhead sport harvest rates on Pahsiomeroi stock steelhead in return years1995-2015. Harvest is assciated with smolts reared at Niagara Springs Fish Hatchery and released at the Pahsimeroi Fish Hatchery Weir.

Run Year	Stock	Estimated Harvest	Total Return to LGD	Harvest Rate (%)
1995/1996	Pahsimeroi	2,840	4,900	58%
1996/1997	Pahsimeroi	3,805	5,786	66%
1997/1998	Pahsimeroi	6,161	8,225	75%
1998/1999	Pahsimeroi	2,729	5,125	53%
1999/2000	Pahsimeroi	2,320	4,266	54%
2000/2001	Pahsimeroi	2,691	6,311	43%
2001/2002	Pahsimeroi	8,299	19,824	42%
2002/2003	Pahsimeroi	5,884	11,494	51%
2003/2004	Pahsimeroi	5,374	12,637	43%
2004/2005	Pahsimeroi	4,837	8,403	58%
2005/2006	Pahsimeroi	6,107	11,470	53%
2006/2007	Pahsimeroi	4,346	10,421	42%
2007/2008	Pahsimeroi	9,429	18,268	52%
2008/2009	Pahsimeroi	6,948	13,207	53%
2009/2010	Pahsimeroi	24,707	42,433	58%
2010/2011	Pahsimeroi	11,515	18,479	62%
2011/2012	Pahsimeroi	7,027	15,860	44%
2012/2013	Pahsimeroi	4,613	9,296	50%
2013/2014	Pahsimeroi	6,417	12,736	50%
2014/2015	Pahsimeroi	3,180	6,901	46%
Data Source: IDFG unpublished data				

3.4 RELATIONSHIP TO HABITAT PROTECTION AND RECOVERY STRATEGIES

This section describes the major factors affecting natural production. Hatchery production for harvest mitigation is influenced but not specifically linked to habitat protection strategies in the Salmon River subbasin or other areas.

3.5 ECOLOGICAL INTERACTIONS. [PLEASE REVIEW ADDENDUM A BEFORE COMPLETING THIS SECTION. IF IT IS NECESSARY TO COMPLETE ADDENDUM A, THEN LIMIT THIS SECTION TO NMFS JURISDICTIONAL SPECIES. OTHERWISE COMPLETE THIS SECTION AS IS.]

The operation of anadromous fish hatchery programs has the potential to negatively affect ESA listed salmon and steelhead. Flagg et al. (2000) provide a thorough literature review of studies assessing the ecological interactions of hatchery reared and wild spring/summer Chinook salmon and steelhead. In general, the studies they reviewed documented some negative interaction through competition, predation, behavioral modification and fish health but, there is a general lack of information that quantifies the extent of the interactions. They also note that these potential interactions can be reduced with specific hatchery operational guidelines such as rearing fish to full term smolts to reduce the overlap for food and habitat requirements. The summer steelhead hatchery program in the Pahsimeroi River population MPG has the potential to affect wild Chinook, summer steelhead, sockeye salmon, and bull trout.

In order to minimize negative ecological interactions between hatchery and natural populations of salmon and steelhead, the time period that hatchery and natural fish have to potentially interact can be minimized. All of the steelhead released that are part of the Pahsimeroi Fish Hatchery mitigation program are reared to full smolts and exhibit rapid downstream migration after release thus reducing the time they have to interact with wild salmonids in the rearing area and migratory corridor.

We have evaluated potential interactions between listed steelhead and salmon and hatchery steelhead and their effect in the migration corridor of the Salmon River and downstream. Timing of hatchery-origin steelhead in the migration corridor overlaps with timing of listed spring/summer Chinook salmon, steelhead, and to a lesser degree with listed sockeye salmon. Steelhead are more temporally separated from listed fall Chinook salmon in the Snake River and Lower Granite Reservoir based on different migration periods.

Because of their size and timing, Chinook salmon fry are probably the most vulnerable to predation. Hillman and Mullan (1989) observed substantial predation of newly emerged Chinook salmon by hatchery and wild steelhead in the Wenatchee River. Cannamela (1992) used existing literature to evaluate potential predation of Chinook salmon fry by hatchery steelhead smolts. He evaluated a 1-1.3 million steelhead smolt release in the upper Salmon River primary production area, where steelhead were released in the vicinity of redds and migrated over redds for several miles. He assumed steelhead smolts at least 105 mm could consume Chinook salmon fry, 35-37 mm in length. Cannamela estimated potential predation by using various percentages of fry in the diet, residualism, and predator size. Using ranges of assumptions, he calculated estimated fry losses to predation by steelhead smolts and residuals for up to a 70-day period from smolt release to June 25. According to his calculations, his scenario of 500,000 steelhead predators using fish as 1 percent of their diet for 40 days resulted in potential consumption of 34,500 fry. Empirical information collected in 1992 infers that this may be an overestimate. IDFG biologists attempted to quantify Chinook salmon fry predation by hatchery steelhead in the upper Salmon River. Their samples were collected from a release of 774,000 hatchery steelhead in the upper Salmon River primary production area where steelhead would migrate directly over redds. The fish were released in early April. The biologists sampled 6,762 steelhead and found that 20 contained fish parts in the cardiac stomach. Of these, three contained 10 Chinook salmon fry. The biologists estimated that the proportion of hatchery steelhead that consumed fry was 0.000444. The estimated predation rate of steelhead smolts on Chinook salmon fry was 1.48 x 10-3 (95% CI 0.55 x 10-3 to 2.41 x 10-3) for the 6,762 hatchery steelhead smolts examined that consumed the ten Chinook fry. Biologists used this consumption rate to estimate that the total number of Chinook fry consumed during the sample period, April 3-June 3, was 24,000 fry (IDFG 1993). We believe that the potential consumption for steelhead releases lower in the Salmon River would be much lower because steelhead are not released in the immediate vicinity of redds and emerging fry.

Cannamela (1992) estimated fry losses would occur for up to a 70-day period from smolt release to June 25. He noted that there is an assumed mechanism for Chinook salmon fry to avoid predation by steelhead since they are coevolved populations. However, literature references were scant about this theory although Peery and Bjornn (1992) documented that Chinook fry tend to move at night. Cannamela concluded that only assumptions could be made about the availability and vulnerability of fry to steelhead predators.

Martin et al. (1993) collected 1,713 steelhead stomachs from the Tucannon River and three contained juvenile spring Chinook salmon. They estimated that 456-465 juvenile spring Chinook salmon were consumed by hatchery steelhead in the Tucannon River from a total release of 119,082 steelhead smolts. Biologists found that rate of predation increased from the time of steelhead release through September 31. Predation rates increased from 9.4 x 10-3 to 4.3 x 10-2. Martin et al. (1993) theorized that although numbers of steelhead decreased, remaining fish may have learned predatory behavior. By October, juvenile salmon were too large to be prey, and stream temperature had dropped.

No precise data are available to estimate the importance of Chinook salmon fry in a steelhead smolt's diet (USFWS 1992). The USFWS cited several studies where the contents of steelhead stomachs had been examined. Few, if any, salmonids were found. They concluded that the limited empirical data suggested that the number of Chinook salmon fry/fingerlings consumed by steelhead is low. Schriever (IDFG, pers. comm.) sampled 52 hatchery steelhead in the lower Salmon and Clearwater rivers in 1991 and 1992 and found no fish in their stomach contents.

Steelhead residualism in the upper Salmon River appeared to be about 4 percent in 1992 (IDFG 1993). In 1992, the steelhead smolt migration in the Salmon River primary production area began around May 10 and about 95% of the hatchery steelhead had left the upper Salmon River study area by May 21. IDFG biologists found that after one week, hatchery steelhead smolts were consuming natural prey items such as insects and appeared to be effectively making the transition to natural food (IDFG 1993). It is unknown if smolts continued to feed as they actively migrated. Biologists observed that the environmental conditions during the 1992 study were atypical. Water velocity was much lower, while water temperature and clarity were higher than normal for the study period. Furthermore, about 637,500 of the smolts had been acclimated for up to three weeks at Sawtooth Fish Hatchery prior to release, but these fish were not fed during acclimation. It is unknown if acclimation reduced residualism. Biologists concluded that within the framework of 1992 conditions, Chinook fry consumption by hatchery steelhead smolts and residuals was very low.

Kiefer and Forster (1992) were concerned that predation on natural Chinook salmon smolts by hatchery steelhead smolts released into the Salmon River at Sawtooth Fish Hatchery could be causing mortality. They compared PIT-tag detection rates of upper Salmon River natural Chinook salmon emigrating before and after the steelhead smolt releases for the previous three years. They found no significant difference and concluded that the hatchery steelhead smolts were not preying upon the natural Chinook smolts to any significant degree.

The release of a large number of prey items which may concentrate predators has been identified as a potential effect on listed salmon. Hillman and Mullan (1989) reported that predaceous rainbow trout (>200 mm) concentrated on wild salmon within a moving group of hatchery age-0 Chinook salmon. The wild salmon were being "pulled" downstream from their stream margin stations as the hatchery fish moved by. It is unknown if the wild fish would have been less vulnerable had they remained in their normal habitat. Hillman and Mullan (1989) also observed that the release of hatchery age-0 steelhead did not pull wild salmon from their normal habitat. During their sampling in 1992, IDFG biologists did not observe predator concentration. We have no further information that supports or disproves the concern that predators may concentrate and affect salmon because of the release of large numbers of hatchery steelhead.

There is potential for hatchery steelhead smolts and residuals to compete with Chinook salmon and natural steelhead juveniles for food and space, and to potentially modify their behavior. The literature suggests that the effects of behavioral or competitive interactions would be difficult to evaluate or quantify (Cannamela 1992, USFWS 1993). Cannamela (1992) concluded that existing information was not sufficient to determine if competitive or behavioral effects occur to salmon juveniles from hatchery steelhead smolt releases. Our strategy of releasing smolts over several days should reduce release densities at a single site.

Cannamela's (1992) literature search indicated that there were different habitat preferences between steelhead and

Chinook salmon that would minimize competition and predation. Spatial segregation appeared to hinge upon fish size. Distance from shore and surface as well as bottom velocity and depth preferences increased with fish size. Thus, Chinook salmon fry and steelhead smolts and residuals are probably not occupying the same space. Cannamela theorized that if interactions occur, they are probably restricted to a localized area because steelhead, which do not emigrate, do not move far from the release site. Within the localized area, spatial segregation based on size differences would place Chinook salmon fry and fingerlings away from steelhead smolts and residuals. This would further reduce the likelihood of interactions. Martin et al. (1993) reported that in the Tucannon River, spring Chinook salmon and steelhead did exhibit temporal and spatial overlap, but they discuss that the micro-habitats of the two species were likely very different.

The USFWS (1992) theorized that the presence of a large concentration of steelhead at and near release sites could modify the behavior of Chinook. However, they cited Hillman and Mullan (1989) who found no evidence that April releases of steelhead altered normal movement and habitat use of age-0 Chinook. Throughout their study, IDFG biologists (IDFG 1993) noted concentrations of fry in typical habitat areas, whether steelhead were present or not.

Cannamela (1992) also described the potential for effects resulting from the release of a large number of steelhead smolts in a small area over a short period of time. He theorized that high concentrations of steelhead smolts could limit Chinook salmon foraging opportunities or limit available food. However, the effect would be of limited duration because most steelhead smolts emigrate or are harvested within two months of release. He found no studies to support or refute his hypothesis. Cannamela also discussed threat of predation as a potentially important factor causing behavioral changes by stream salmonids. The literature was not specific to interactions of steelhead smolts and Chinook fry. It is assumed that coevolved populations would have some mechanism to minimize this interaction.

There is a potential effect to listed salmon from diseases transmitted from hatchery-origin steelhead adults. Pathogens that could be transmitted from adult hatchery steelhead to naturally produced Chinook salmon include Infectious Hematopoietic Necrosis Virus (IHNV) and Bacterial Kidney Disease (BKD). Although adult hatchery-origin steelhead may carry pathogens of Chinook, such as BKD and Whirling Disease, which could be shed into the drainage, these diseases are already present in the Salmon River headwaters in naturally produced Chinook and steelhead populations. The prevalence of BKD is less in hatchery-origin steelhead than in naturally produced Chinook salmon. Idaho Chinook salmon are rarely affected by IHNV (D. Munson, IDFG, pers. comm.). Idaho Department of Fish and Game disease monitoring will continue as part of the IDFG fish health program. We do not believe that the release of hatchery-origin steelhead adults in the Pahsimeroi River will increase the prevalence of disease in naturally produced Chinook salmon or steelhead.

Hauck and Munson (IDFG, unpublished) provide a thorough review of the epidemiology of major Chinook pathogens in the Salmon River drainage. The possibility exists for horizontal transmission of diseases to listed Chinook salmon or natural steelhead from hatchery-origin steelhead in the migration corridor. Current hatchery practices include measures to control pathogens at all life stages in the hatchery. Factors of dilution, low water temperature, and low population density of listed anadromous species in the production area reduce the potential of disease transmission. However, none of these factors preclude the existence of disease risk (Pilcher and Fryer 1980, LaPatra et al. 1990, Lee and Evelyn 1989). In a review of the literature, Steward and Bjornn (1990) stated there was little evidence to suggest that horizontal transmission of disease from hatchery smolts to naturally produced fish is widespread in the production area or free-flowing migration corridor. However, little research has been done in this area.

Transfers of hatchery steelhead between any facility and the receiving location conforms to PNFHPC guidelines. IDFG and USFWS personnel monitor the health status of hatchery steelhead using protocols approved by the Fish Health Section, AFS. Disease sampling protocol, in accordance to the PNFHPC and AFS Bluebook is followed.

IDFG hatchery and fish health personnel sample the steelhead throughout the rearing cycle and a pre-release sample is analyzed for pathogens and condition. Baseline disease monitoring of naturally produced Chinook salmon has been implemented in the upper Salmon River. At this time, we have no evidence that horizontal transmission of disease from the hatchery steelhead release in the upper Salmon River has an adverse effect on listed species. Even with consistent monitoring, it would be difficult to attribute a particular incidence or presence of disease to actions of the hatchery steelhead programs.

SECTION 4. WATER SOURCE

4.1 PROVIDE A QUANTITATIVE AND NARRATIVE DESCRIPTION OF THE WATER SOURCE (SPRING, WELL, SURFACE), WATER QUALITY PROFILE, AND NATURAL LIMITATIONS TO PRODUCTION ATTRIBUTABLE TO THE WATER SOURCE.

Lower Pahsimeroi Fish Hatchery – Water from the Pahsimeroi River is supplied to the adult trap and holding ponds through a 0.25-mile earthen intake canal. Water from the canal is also used to supply the four early rearing raceways (not currently used for steelhead production). The intake canal is equipped with NOAA Fisheries approved rotating drum screens designed to prevent entrainment of wild Chinook salmon and steelhead from the river into the hatchery facility. IPC holds a water right to divert 40 cfs of river water from the Pahsimeroi River for operations at the lower hatchery. Pahsimeroi River water temperatures at this site vary throughout the year from seasonal lows of 33°F in the winter to seasonal highs of 72°F in the summer. Daily fluctuations can be as much as 12°F.

A small pathogen-free spring-water source supplies water to the spawning building and hatchery building for rinsing and water hardening green eggs. This water is pumped to a 10,000 gallon holding tank and gravity-fed to the two locations. The spring can produce up to 200 gpm of 52-56°F water.

Upper Pahsimeroi Fish Hatchery – The upper PFH operates on a combination of well water and river water. Summer steelhead egg incubation occurs solely on well water pumped from three on-site wells. Up to 14 cfs of well water is pumped to an elevated aeration tank for gas abatement before flowing via gravitational force to egg incubators and rearing vats located within the hatchery building. Well water temperature is a constant 50°F. Current incubation and rearing operations at the upper hatchery are conducted under National Pollutant Discharge Elimination System (NPDES) permit IDG130039. The permit specifies waste discharge standards for net total suspended solids and net total phosphorus. The river water supply at the upper PFH is used exclusively for Chinook salmon rearing and will not be discussed in this HGMP.

Niagara Springs Fish Hatchery – IPC holds a water right to divert 132 cfs from Niagara Springs for hatchery operation. Water from Niagara Springs is a constant 59°F and is supplied to NSFH at two separate intakes. Water is gravity fed from Niagara Springs to the incubators, nursery vats, fire hydrants, and irrigation system via one intake and to the outdoor rearing raceways via a second intake. Current rearing operations at NSFH are conducted under National Pollutant Discharge Elimination System (NPDES) permit IDG130013. The permit specifies waste discharge standards for net total suspended solids and net total phosphorus.

4.2 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR THE TAKE OF LISTED NATURAL FISH AS A RESULT OF HATCHERY WATER WITHDRAWAL, SCREENING, OR EFFLUENT DISCHARGE

Pahsimeroi Fish Hatchery – Hatchery intakes at both the upper and lower PFH facilities are equipped with NOAA Fisheries-approved rotating drum screens designed to prevent wild fish from being entrained at hatchery water intake diversions. Additionally, all effluent water discharged to the Pahsimeroi River is monitored regularly for compliance with NPDES standards.

Niagara Springs Fish Hatchery – Listed natural fish are not present in Niagara Springs, therefore no risk aversion measures are needed. However, all effluent water discharged to Niagara Springs Creek is monitored regularly for compliance with NPDES standards.

SECTION 5. FACILITIES

5.1 BROODSTOCK COLLECTION FACILITIES (OR METHODS)

Adult summer steelhead collection at the lower PFH is facilitated by a removable barrier weir that spans the Pahsimeroi River. This structure diverts adults through an attraction canal and a fish ladder supplied with up to 40 cfs of river water. The adult trap consists of a concrete pond measuring 70 feet long x 16 feet wide x 6 feet deep. The trap is situated between two additional concrete ponds (each measuring 70 feet long x 16 feet wide x 6 feet deep) that are used as the adult holding ponds. Summer steelhead return to PFH from late February through mid-May. Fish volitionally migrate into the adult trap where they are manually sorted into the adult holding ponds. The trap is checked several times per week and all fish are handled in accordance with protocols established by NOAA Fisheries. Fish are examined for fin clips, measured to the nearest centimeter for fork length, and identified by sex. Adults retained for artificial propagation are placed in the holding ponds to await spawning. All natural-origin adults are passed upstream of the weir. Scale and tissue samples are collected from all natural adults.

5.2 FISH TRANSPORTATION EQUIPMENT (DESCRIPTION OF PEN, TANK TRUCK, OR CONTAINER USED)

Generally, adult transportation at the lower PFH is unnecessary as hatchery-produced adults are trapped and spawned on site. However, in the event that adult summer steelhead return in excess of specific program needs, an adult transportation vehicle (equipped with oxygen and a fresh flow agitator system) may be used to transfer fish to provide fishing opportunities.

5.3 BROODSTOCK HOLDING AND SPAWNING FACILITIES

Broodstock are held in two concrete adult holding ponds at PFH (each measuring 70 feet long x 16 feet wide x 6 feet deep) that are located on either side of the adult trap described in Section 5.1. Roughly 24 cfs of the 40 cfs of flow diverted into the intake canal is available to supply water to these two holding ponds. Each of the two ponds provide approximately 6,720 cubic feet of holding space. The total holding capacity for the adult trap and holding ponds is approximately 3,000 adult summer steelhead. Steelhead spawning commences in mid March and continues through early May on a twice-per-week basis.

5.4 INCUBATION FACILITIES

Pahsimeroi Fish Hatchery – PFH's incubation room is located at the upper facility. The incubation room consists of twenty 16-tray stacks of Marisource vertical flow incubators supplied with 120 gpm of chilled (40°F) and unchilled (50° F) pumped well water (240 gpm total). Summer steelhead eggs are incubated to eyed-up or swim-up in this location and then transferred to NSFH for final incubation and rearing.

Niagara Springs Fish Hatchery – NSFH's incubation room consists of 76 upwelling incubators and 38 rectangular vats for hatching and early rearing of steelhead fry. Each incubator provides approximately 0.82 cubic feet of egg incubation space and each vat provides 454 cubic feet of rearing space for fry until they are moved to the outdoor concrete raceways. Depending on water availability, incubator flows range between 20 to 25 gpm and flows in the vats will approach 185 gpm. The incubation room is supplied with 59°F gravity fed spring water from Niagara Springs.

5.5 REARING FACILITIES

All early rearing occurs at NSFH within the incubation room of the hatchery building or in the outdoor concrete raceways. The incubation room contains 38 rectangular fiberglass vats that are supplied with constant 59°F spring water from Niagara Springs. All vats measure 46 feet long x 4.08 feet wide x 2.42 feet deep (454 cubic feet). Fish are reared in these vats until they reach approximately 110 fish per pound, at which point they are transferred to outdoor concrete raceways. These raceways measure 300 feet long x 10 feet wide x 2½ feet deep and are each supplied with up to 6.3 cfs of water from Niagara Springs.

5.6 ACCLIMATION/RELEASE FACILITIES

Juvenile steelhead are reared at NSFH in the concrete raceways from fry until release as yearling smolts. At release, all fish at NSFH are pumped from the raceways into the smolt tankers described in Section 10.5. Smolt tankers are filled with spring water chilled to approximate the temperature of the receiving water. In April, steelhead smolts are loaded onto transport tankers and hauled to the lower PFH where they are directly released into the Pahsimeroi River.

5.7 DESCRIBE OPERATIONAL DIFFICULTIES OR DISASTERS THAT LED TO SIGNIFICANT FISH MORTALITY

No operational difficulties or disasters have led to significant steelhead mortality at PFH or NSFH.

5.8 INDICATE AVAILABLE BACK-UP SYSTEMS, AND RISK AVERSION MEASURES THAT WILL BE APPLIED, THAT MINIMIZE THE LIKELIHOOD FOR THE TAKE OF LISTED NATURAL FISH THAT MAY RESULT FROM EQUIPMENT FAILURE, WATER LOSS, FLOODING, DISEASE TRANSMISSION, OR OTHER EVENTS THAT COULD LEAD TO INJURY OR MORTALITY.

Lower Pahsimeroi Fish Hatchery - The lower PFH has two full-time employees residing at the facility for security purposes. The adult trap and holding ponds are gravity fed from the Pahsimeroi River and are therefore not subject to water supply interruption. Protocols are in place to guide the disinfection of equipment and gear to minimize risks associated with the transfer of potential disease agents.

Upper Pahsimeroi Fish Hatchery –Upper PFH is equipped with numerous water level, temperature, flow and power failure alarms. An audible horn and telephone dialer alert staff, both on and off site, to abnormal conditions. A 450 kW standby generator capable of powering all critical life support equipment is installed to compensate for interruptions in utility power lasting more than 7 seconds. Protocols are established by IDFG to guide their response to emergency situations and a full-time hatchery employee resides less than one mile from the hatchery site. Additional protocols guide the disinfection of equipment and gear to minimize risks associated with the transfer of potential disease agents.

Niagara Springs Fish Hatchery – NSFH has three full-time employees residing at the facility for security purposes. The incubation room and outdoor raceways are gravity fed from Niagara. Two rotating traveling screens sit in front of the 48” intake pipe to collect and remove leaves and algae during the fall months from the outdoor raceways. The rotating traveling screens can be programmed by hatchery personnel to come on at certain times throughout the day and night for specified time intervals. The traveling screens are alarmed by a Programmable Logic Controller (PLC) that will call hatchery personnel in case one or both fail to start. There is also a flow meter inside the 48” pipe that will trigger a call to the hatchery personnel in case flow is reduced to the outdoor raceways. Permanent employees are required to be on alarm duty as a condition of employment. Hatchery personnel rotate alarm duty on a weekly basis. Protocols are also in place to guide the disinfection of equipment and gear to minimize risks associated with the transfer of potential disease agents.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

This section describes the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1 SOURCE

Presently, the PFH summer steelhead program uses only hatchery-origin summer steelhead returning to the Pahsimeroi River as a broodstock source. The history of PFH broodstock sources since the hatchery’s completion in 1968 is provided in Section 6.2.1.

6.2 SUPPORTING INFORMATION

6.2.1 History

The Pahsimeroi River summer steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The natural Pahsimeroi River population is an A-run, and is classified as threatened under the endangered species act, and is identified as “intermediate” by the Interior Columbia Basin Technical Review Team (ICTRT).

Summer steelhead broodstock development for the PFH summer steelhead program occurred from 1965 through 1968 when wild summer steelhead adults were trapped at Oxbow and Hells Canyon dams on the Snake River and transferred to OFH for spawning and incubation and then to NSFH for rearing. These fish would have likely been a mixture of steelhead that originated from tributaries to the Snake River upstream of Hells Canyon Dam. There are no records to suggest that summer steelhead from other locations contributed to the initial development of this broodstock. Following rearing at NSFH, progeny of these initial broodfish were released into the Pahsimeroi River as yearling smolts in 1967, with the intent of transferring Snake River steelhead to the upper Salmon River basin. Starting in 1969, IDFG began trapping and spawning Snake River-origin adult steelhead as they returned to the Pahsimeroi Hatchery. From 1969 to 1986, IDFG spawned returning hatchery-origin steelhead at PFH and used the progeny to fulfill stocking needs in both the Salmon and Snake rivers. During this time, some wild Pahsimeroi River steelhead may have contributed to the hatchery population because not all hatchery fish were marked and could not be visually differentiated from wild fish. Additionally, B-run steelhead smolts originating from Dworshak Hatchery were released into the Pahsimeroi River in 1974 and 1978. Reingold (1977) reports that upon return as adults, these fish were not segregated from Pahsimeroi stock and that eggs and sperm were mixed during spawn-taking operations. Efforts to identify hatchery-origin steelhead using mass marking techniques (i.e. adipose fin-clipping all hatchery-origin steelhead juveniles) began in 1983 (1984 smolt release). Subsequent returns of adipose-clipped one ocean adults in 1986 allowed hatchery staff to select only hatchery-origin fish for broodstock purposes.

6.2.2 Annual size

No natural-origin fish are incorporated into the hatchery broodstock. Approximately 220 hatchery-origin females and 220 hatchery-origin males are needed to produce the targeted release of 800,000 yearling smolts. In addition, approximately 235 pairs of Pahsimeroi stock adults are spawned for production identified in other HGMPs.

6.2.3 Past and proposed level of natural fish in broodstock

Broodstock for the NSFH program originated from wild summer steelhead adults trapped at Oxbow and Hells Canyon dams on the Snake River from 1965 through 1968. From 1969 through 1985, hatchery broodstock likely included wild Pahsimeroi river summer steelhead and a limited number of Clearwater B-run steelhead from Dworshak Hatchery. With the establishment of mass marking protocols for positive identification of hatchery-origin adults returning in 1986, the broodstock has been limited to only hatchery-origin returns. There are currently no plans to incorporate naturally produced fish into the NSFH broodstock.

6.2.4 Genetic or ecological differences

Describe any known genotypic, phenotypic, or behavioral differences between current or proposed hatchery stocks and natural stocks in the target area.

Previous genetic analyses using 11 microsatellite loci found no significant differences in allelic structure among hatchery steelhead populations from the Oxbow, Pahsimeroi, and Sawtooth hatcheries (Nielsen et al. 2009). This is not surprising given that the Pahsimeroi and Oxbow stocks were derived primarily from wild adults trapped at Oxbow and Hells Canyon dams in the mid 1960s, and the Sawtooth stock was founded from the Pahsimeroi stock. In that same study, large genetic differentiation was observed between wild juvenile steelhead samples collected from rotary screw traps in the Pahsimeroi River and Lemhi River and all other wild and hatchery steelhead sample collections from the Salmon River (Nielsen et al. 2009). IDFG (unpublished data- available from matthew.campbell@idfg.idaho.gov) observed similar results using 13 microsatellite loci, with juvenile samples collected from a rotary screw trap on the Lemhi River exhibiting significant genetic differentiation from other wild and hatchery steelhead populations in the Upper Salmon (data not shown). However, genetic assignment tests suggested that these differences were likely due to that fact that the juvenile samples had been drawn from more than one *O. mykiss* population, with at least one, introgressed with alleles from stocked hatchery rainbow trout (of "coastal" origin). Microsatellite analyses (13 loci) of samples of wild adult steelhead passed above the weir on the Pahsimeroi River indicate low genetic differentiation when compared to hatchery adult samples from the Pahsimeroi Fish Hatchery ($F_{ST} < 0.01$); IDFG unpublished data). Similar results were observed between wild adults released above the weir at the Sawtooth Fish Hatchery and hatchery adult samples (($F_{ST} < 0.01$); IDFG unpublished data). Previous genetic analyses indicate that introgression from stocked hatchery steelhead

(Pahsimeroi and Sawtooth) has occurred throughout the upper Salmon River and that many wild populations in these area exhibit little to no genetic differentiation from these hatchery populations (Nielsen et al. 2009).

6.2.5 Reasons for choosing

Section 6.2.1 provides a history of NSFH summer steelhead broodstock development.

6.3 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR ADVERSE GENETIC OR ECOLOGICAL EFFECTS TO LISTED NATURAL FISH THAT MAY OCCUR AS A RESULT OF BROODSTOCK SELECTION PRACTICES.

No adverse impacts or effects to the listed population are expected as wild/natural adults are not used for broodstock purposes.

SECTION 7. BROODSTOCK COLLECTION

7.1 LIFE-HISTORY STAGE TO BE COLLECTED (ADULTS, EGGS, OR JUVENILES)

Hatchery-origin adult summer steelhead are collected at the lower PFH weir for this program.

7.2 COLLECTION OR SAMPLING DESIGN

Adult summer steelhead collection occurs at the lower PFH and is facilitated by a removable barrier weir that spans the Pahsimeroi River. Adults retained for broodstock production are selected over the entire return period to avoid a biased sample based on adult return timing. Adults return to the hatchery in late February through early May and are spawned in mid-March through early May.

7.3 IDENTITY

Fish are identified via tags or external marks. All hatchery fish produced for mitigation purposes are marked with an adipose fin clip and are the only fish returning to the weir with this mark.

7.4 PROPOSED NUMBER TO BE COLLECTED

7.4.1 Program goal (assuming 1:1 sex ratio for adults)

Approximately 220 female and 220 male summer steelhead are spawned annually to meet program objectives for Pahsimeroi A-run summer steelhead reared at NSFH and released in the Pahsimeroi River. In addition, approximately 235 pairs of Pahsimeroi stock adults are spawned for production identified in other HGMPs.

7.4.2 Broodstock collection levels for the last twelve years or for most recent years available

Broodstock collection levels from 1994 to 2014 for PFH's summer steelhead program are summarized in Table 6. In addition to the adults spawned to produce the smolt release at the Pahsimeroi Fish Hatchery weir, Table 6 includes additional fish that are spawned to produce smolts released into the Little Salmon R that are part of the HCSA mitigation, and also for production that is part of the LSRCP mitigation and Shoshone-Bannock Tribes' Streamside Incubation Program (SSI).

Table 6. Number of female steelhead spawned at Pahsimeroi Fish Hatchery 1994-2014.

Return Year	Number of Females Spawned[1]
1994	473
1995	800
1996	1,178
1997	753
1998	1,035
1999	820
2000	998
2001	1,380
2002	1,219
2003	978
2004	1,061
2005	1,139
2006	981
2007	1215
2008	895
2009	652
2010	612
2011	612
2012	750
2013	576
2014	706

Source: Pahsimeroi Fish Hatchery Summer Steelhead Run Reports (1994-2014).

[1] Includes females spawned for other IPC funded releases in the Little Salmon R., for LSRCP funded programs in the Salmon R and Little Salmon R., as well as the Shoshone Bannock streamside incubation program.

7.5 DISPOSITION OF HATCHERY-ORIGIN FISH COLLECTED IN SURPLUS OF

BROODSTOCK NEEDS

Disposition of surplus hatchery-origin adults collected at PFH varies based on adult return numbers and management objectives. Disposition of surplus fish has included hauling fish to non-anadromous waters to provide fishing opportunity, killing fish and freezing the carcasses for rendering at a later date, and distributing carcasses to the public, tribal entities, or charitable organizations, or for nutrient enhancement in local watersheds.

7.6 FISH TRANSPORTATION AND HOLDING METHODS

Adult summer steelhead migrate into the adult holding/spawning facility at the lower PFH; therefore, no fish transportation is needed unless excess fish are outplanted into non-anadromous waters to support a fishery. See sections 5.2 and 5.3 for a description of the trapping and holding facilities. Upon removal from the trap, adults are identified by sex, examined for fin clips and/or tags, and measured to the nearest millimeter for fork length.

7.7 DESCRIBE FISH HEALTH MAINTENANCE AND SANITATION PROCEDURES APPLIED

Fish health monitoring at spawning includes sampling for viral, bacterial, and parasitic disease agents. Ovarian fluid and kidney/spleen tissue samples are collected from a minimum of 150 females to test for Infectious Hematopoietic Necrosis (IHN) and Infectious Pancreatic Necrosis (IPN) (120 ovarian fluid samples and 30 kidney/spleen samples). Kidney samples are collected from 60 spawned females and tested for BKD. Head wedges are taken from 20 of the adults spawned and tested for whirling disease. Necropsies are performed on pre-spawn mortalities as dictated by IDFG's Eagle Fish Health Laboratory.

7.8 DISPOSITION OF CARCASSES

During the spawning season, all carcasses not suitable for donation to the public, tribal entities, or charities are placed in a refrigeration unit and frozen. At the conclusion of spawning, these carcasses are transported to a rendering plant in Kuna, ID for disposal. Carcasses may be out planted in local watersheds for nutrient enhancement.

7.9 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR ADVERSE GENETIC OR ECOLOGICAL EFFECTS TO LISTED NATURAL FISH RESULTING FROM THE BROODSTOCK COLLECTION PROGRAM.

The broodstock consists only of hatchery-origin adults and all natural-origin fish are immediately passed upstream of the weir. Fish health maintenance and hatchery facility sanitation guidelines are established and monitored by IDFG's Eagle Fish Health Laboratory.

SECTION 8. MATING

This section describes fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1 SELECTION METHOD

Broodstock are retained throughout the run to represent the full spectrum of the population. During spawning, ripe steelhead that enter the trap on spawn days are spawned first. Then, previously trapped fish are sorted and ripe fish are spawned to meet production goals. During sorting, males and females will be collected in equal numbers. Currently, spawning occurs two days per week and males and females are spawned in a 1:1 ratio as they ripen. During low return years males may be re-ponded and used multiple times if necessary. On a given spawn day, a random cross section of the run is used to maximize the genetic diversity and to maintain a wide run and spawn period.

8.2 MALES

Generally, males are used only once for spawning. In cases where skewed sex ratios exist (fewer males than females), or in situations where males mature late, males may be used more than once.

8.3 FERTILIZATION

During spawning, eggs from each female are drained of ovarian fluid and fertilized with milt from one male (1:1 spawn ratio). Females with poor egg quality or bloody ovarian fluid will not be used for production. Males that expel bloody or watery milt will not be used. After milt is added to the eggs, one cup of spring water is added to each bucket to activate the sperm, swirled, and allowed to set for 2 minutes. Eggs are then carried into the hatchery building where they are allowed to water harden in a 100 ppm solution of iodophor for 30 minutes. At the conclusion of each spawn day, eggs are transported from the lower PFH to the upper PFH via 75 quart coolers and loaded into Marisource vertical flow incubator trays. Each incubator will contain the eggs from two females. Tissue samples for DNA analysis will be collected from all fish spawned for production purposes.

All carcasses are sampled for disease pathogens and then frozen or distributed to the public.

8.4 CRYOPRESERVED GAMETES

Cryopreserved milt is not collected or used as part of the IPC summer steelhead mitigation program at PFH.

8.5 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR ADVERSE GENETIC OR ECOLOGICAL EFFECTS TO LISTED NATURAL FISH RESULTING FROM THE MATING SCHEME

No natural-origin adults are incorporated into the hatchery broodstock. Managers do not expect any adverse effects to the natural population from the current segregated broodstock management.

SECTION 9. INCUBATION AND REARING

9.1 INCUBATION

9.1.1 Number of eggs taken and survival rates to eye-up and/or ponding

Survival by lifestage for Pahsimeroi A-run steelhead reared at NSFH are provided in Table 7.

Table 7. Niagara Springs Fish Hatchery Pahsimeroi A-run summer steelhead survival rates from green egg to ponding (fry) and release (smolts) by brood year (1994-2014).[1]

Spawn Year	Total Green Egg Take for PFH Production	Total Eyed Eggs for PFH Production	Percent Eye Up	# of Fry Ponded	Percent Survival-Green egg to Fry	No. of Smolts Released	Percent Survival-Green Egg to Smolt
1994	no data	1,074,010	no data	1,042,728	no data	960,429	no data
1995	1,761,633	1,402,260	79.60%	1,360,230	77.20%	957,228	55.80%
1996	1,637,074	1,321,119	80.70%	1,282,194	78.30%	929,487	56.80%
1997	1,839,134	1,472,030	80.00%	1,428,518	77.70%	969,388	52.70%
1998	1,707,808	1,416,800	83.00%	1,374,296	80.50%	1,001,119	59.10%
1999	2,013,205	1,717,897	85.30%	1,666,360	82.80%	1,011,633	72.10%
2000	1,670,914	1,438,458	86.10%	1,395,898	83.50%	1,084,258	80.40%
2001	1,831,147	1,364,602	74.50%	1,324,250	72.30%	1,032,501	77.90%
2002	1,297,179	1,153,722	88.90%	1,119,622	86.30%	1,028,488	79.30%
2003	1,367,068	1,142,848	83.60%	1,109,071	81.10%	1,080,371	79.00%
2004	1,521,492	1,134,017	74.50%	1,100,685	72.30%	935,589	61.50%
2005	1,405,447	1,146,929	81.60%	1,113,038	79.20%	1,051,302	74.80%
2006	1,858,369	1,230,110	66.20%	1,193,761	64.20%	1,097,185	59.00%
2007	1,340,207	1,124,513	83.90%	1,091,252	81.40%	879,594	65.60%
2008	1,354,001	1,213,185	89.60%	1,177,275	86.95%	1,004,374	81.51%
2009	1,365,979	1,241,675	90.90%	1,204,921	88.21%	978,528	80.46%
2010	1,382,551	1,287,155	93.10%	1,249,055	90.34%	1,150,752	83.23%
2011	1,323,543	1,222,954	92.40%	1,186,755	89.66%	1,011,064	80.06%
2012	1,838,915	1,723,063	93.70%	1,672,060	90.93%	1,552,824	86.41%
2013	1,504,284	1,423,053	94.60%	1,380,931	91.80%	1,259,659	86.65%
2014	1,296,917	1,204,836	92.90%	1,169,173	90.15%	1,083,284	86.51%
10yr Average			**87.89%**		**85.28%**		**78.42%**

Source: Pahsimeroi Fish Hatchery Summer Steelhead Run Reports (1994 - 2007) and Niagara Springs Fish Hatchery Steelhead Brood Year Reports (1994 - 2014).

[1] Survival rate data is for all Pahsimeroi A-run steelhead reared at NSFH regardless of release location and includes smolts released into the Little Salmon R.

9.1.2 Cause for, and disposition of surplus egg takes

PFH has collected surplus eggs during years when the adult return numbers exceeded the number needed for the mitigation program. Surplus eggs generated from this program have allowed managers to guard against catastrophic incubation losses and to transfer eggs to other hatcheries to supplement other mitigation programs. Eggs or fry identified as surplus to production needs are either destroyed at PFH or transported to NSFH or other hatcheries and outplanted as fingerlings to local non-anadromous reservoirs to enhance resident fisheries.

9.1.3 Loading densities applied during incubation

Pahsimeroi Fish Hatchery – Eggs are transported from the lower PFH to the upper PFH in 75 quart coolers and loaded into Marisource vertical flow incubator trays. Each incubator tray is loaded with the eggs from 2 females. Depending on fecundity, the number of eggs in each incubator can range from 9,000 to 12,000.

Niagara Springs Fish Hatchery – Eyed eggs are transported from PFH to NSFH for final incubation and rearing. Eyed eggs are shipped at approximately 400 Fahrenheit Temperature Units (FTUs). Eggs are loaded into 75 quart coolers containing 50°F pathogen-free well water at a loading density of approximately 50,000 eggs per cooler. Upon arrival at NSFH, all eggs are tempered and disinfected with iodine at 100-ppm and then loaded into upwelling incubators located inside the vats. Each vat contains two upwelling incubators and each incubator is loaded with 25,000 to 30,000 eyed eggs.

9.1.4 Incubation conditions

Pahsimeroi Fish Hatchery – All summer steelhead egg incubation occurs at the upper PFH facility. The incubation room includes twenty 16-tray stacks of Marisource vertical flow incubators supplied with 120 gpm of chilled (40°F) and unchilled (50°F) pathogen-free well water (240 gpm total). A 200-gallon head tank provides thermal buffering for any temperature fluctuation. Each incubator stack uses a catch basin to prevent silt and fine sand from circulating through the incubation trays. Incubator flows are initially set at 5 gpm and are eventually increased to 6 gpm. Summer steelhead eggs are incubated to eye-up in the incubation room and then transported to NSFH for final incubation and rearing.

Niagara Springs Fish Hatchery – Incubator flows range between 20 to 25 gpm and flows in the vats will approach 185 gpm. Maximum flow indices should not exceed 1.0 lbs/gpm/in and density indices will peak at 0.35lbs/ft3/in inside the vats. Swim-up fry attain a density index of 0.35

lbs/ft3/in when they leave the incubators for the vats.

9.1.5 Ponding

9.1.6 Fish health maintenance and monitoring.

Pahsimeroi Fish Hatchery – Following fertilization, eggs are rinsed with well water and then water-hardened in a 100-ppm solution of iodophor for 30 minutes. From 48 hours after spawning until eye-up, eggs are treated three times per week with a 1,667-ppm formalin treatment to prevent fungal growth on the eggs and three times per week with a 100-ppm iodophor treatment to prevent soft shell disease. At eye-up (approximately 360 FTUs), the eggs are shocked once by dropping them into a bucket of water from a height of approximately 16 inches. Dead eggs are then picked and enumerated with a Jensorter electronic counter/picker.

Niagara Springs Fish Hatchery – Upon arrival at Niagara Spring FH, eyed eggs are disinfected with iodophor at 100-ppm for 30 minutes prior to tempering and placing in upwelling incubators. Fish health inspection and diagnostic services are provided by IDFG personnel at the Eagle Fish Health Laboratory. Diagnostic services are provided as needed at the request of hatchery personnel. Quarterly on-site inspections include tests for the presence of viral replicating agents, *Renibacterium salmoninarum* and other pathogens. Therapeutics may be used to treat specific disease agents via a medicated feed treatment (i.e. Oxytetracycline). Approximately 50% of the juvenile fish are typically vaccinated against furunculosis (*Aeromonas salmonicida*) using a commercially obtained immersion vaccine.

9.1.7 Indicate risk aversion measures that will be applied to minimize the likelihood

for adverse genetic and ecological effects to listed fish during incubation

No adverse genetic or ecological effects to listed fish are anticipated. To offset potential risk from overcrowding and disease transmission, only eggs from two females are placed in individual incubation trays to keep loading densities low. Using pathogen-free well water for incubation at Pahsimeroi Fish Hatchery eliminates exposure of eggs and sac-fry to the whirling disease pathogen.

9.2 REARING

9.2.1 Provide survival rate data (average program performance) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years or for years dependable data are available.

Survival rate data from green egg to smolt release is provided in Table 7 above.

9.2.2 Density and loading criteria (goals and actual levels)

The target maximum density and flow indices for summer steelhead are 0.35 lbs/ft3/in and 1.5 lbs/gpm/in respectively. Actual density and flow indices achieved at NSFH are typically below these levels for most of the rearing cycle and peak just prior to smolt release. Observed density and flow indices are summarized in Table 8.

Table 8. Average density and loading criteria for Pahsimeroi A-run summer steelhead at NSFH by brood year (1995-2008).

Brood Year	Density Index (lbs/cuft/in)		Flow Index (lbs/gpm/in)		Inflow (cfs)[1]	
	At Ponding (raceways)	At Release	At Ponding (raceways)	At Release	At Ponding (raceways)	At Release
1995	0.29	0.28	0.21	0.74	0.95	6.21
1996	0.44	0.34	0.16	0.79	1.80	5.69
1997	0.60	0.30	0.25	0.73	0.90	6.32
1998	0.50	0.33	0.12	0.87	NA	6.32
1999	0.24	0.37	0.47	0.91	1.70	6.32
2000	0.35	0.34	0.36	0.91	1.00	6.32
2001	0.19	0.37	0.14	0.97	1.51	6.36
2002	0.19	0.33	0.15	0.78	0.85	7.49
2003	0.15	0.27	0.18	0.72	0.87	8.12
2004	0.12	0.28	0.15	0.73	0.63	7.03
2005	0.19	0.34	0.21	0.89	0.70	6.12
2006	0.26	0.31	0.12	0.80	1.31	6.73
2007	0.24	0.27	0.10	0.74	1.44	7.46
2008	0.41	0.36	0.15	0.93	0.95	6.10

Brood Year	Density Index (lbs/cuft/in)		Flow Index (lbs/gpm/in)		Inflow (cfs)[1]	
	At Ponding (raceways)	At Release	At Ponding (raceways)	At Release	At Ponding (raceways)	At Release
2009	0.53	0.32	0.28	0.92	0.44	6.24
2010	0.28	0.37	0.75	0.95	0.46	6.2
2011	0.30	0.31	0.43	0.98	0.50	6.5
2012	0.32	0.29	0.48	1.0	0.93	6.4
2013	0.25	0.40	0.49	0.96	2.56	6.23
2014	0.35	0.39	0.76	0.92	2.10	6.21
2015	0.27	0.42	0.55	0.93	2.06	6.12
2016	0.27	0.41	0.53	0.92	2.10	6.20
2017	0.28	0.42	0.52	0.93	2.09	6.22

Source: Niagara Springs Fish Hatchery Monthly Production Summaries (1995 - 2017).
[1] Inflow at ponding and release are per raceway.

9.2.3 Fish rearing conditions

All eyed eggs received at NSFH are placed in upwelling incubators located inside fiberglass vats. Swim-up fry volitionally emerge from these incubators into the vats were they continue early rearing until reaching approximately 110 fpp. Initial flows in the vats are typically set at approximately 20 to 25 gpm per vat during egg incubation and fry emergence. As fish grow, flows are increased up to a maximum of approximately 185 gpm per vat. The vats are supplied with constant 59°F spring water that is gravity fed from Niagara Springs. When fish reach the target size, they are adipose fin clipped and transferred to the outdoor concrete raceways via the marking trailers. At the peak of production, the screens are installed at 300 feet providing the maximum rearing space in each raceway. Water flows are increased as fish grow to a maximum flow of approximately 6.3 cfs per raceway.

9.2.4 Indicate biweekly or monthly fish growth information (average program performance), including length, weight, and condition factor data collected during rearing, if available.

Juvenile summer steelhead are reared at NSFH for approximately 11 months before being released as full-term yearling smolts into the Pahsimeroi River. After swim-up, all fish are reared in outdoor concrete raceways. While on station at NSFH, steelhead are sample-counted monthly.

Fish are sample-counted monthly throughout the rearing period. Table 9 summarizes NSFH sample count data for the period 2000-2009.

Table 9. Monthly growth of Pahsimeroi A-run summer steelhead at Niagara Springs Fish Hatchery from ponding as fry in raceways to release as smolts (2000-2009).

Month	Average	Average	Avg.	Condition	Average

	Fish Per Pound (fpp)	Length (inches)	Length Increase by Month (inches)	Factor C (x 104)	Monthly Mortality
May	1,903	1.12	0.1	3.2	49,173
June	192	2.01	0.89	3.2	14,734
July	127	2.75	0.74	3.2	5,097
August	58	3.6	0.85	3.3	4,715
September	33	4.3	0.70	3.6	3,324
October	19	5.2	0.90	3.6	2,673
November	12	6.1	0.90	3.6	1,605
December	8	6.9	0.80	3.7	1,208
January	5.6	7.8	0.90	3.7	1,396
February	4.54	8.4	0.60	3.7	1,590
March	4.28	8.5	0.10	3.7	2,448
April	4.27	8.5	0.00	3.6	573
May	4.09	8.89	0.39	3.8	185

Source: Niagara Springs Fish Hatchery Monthly Production Summaries (2000 - 2017).

9.2.5 Indicate monthly fish growth rate and energy reserve data (average program performance), if available.

See Section 9.2.4 above.

9.2.6 Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (average program performance).

Juvenile summer steelhead are fed a dry pelleted diet produced by Rangen, Inc and Skretting Inc. Conversion rate from first ponding to release averages 1.13 pounds of food fed for each pound of weight gain. Food types used, application rates and feed conversions by rearing period from swim-up to smolt release are presented in Table 10.

Table 10. Food types used, application rates and feed conversions by month from swim-up to smolt release at Niagara Springs Fish Hatchery.

Month	Food Type	Application Schedule (# feedings/day)	Feeding Rate Range (% B.W./day)	Food Conversion During Period
May	Rangen #0, #1	10	3.8	.61

Month	Food Type	Application Schedule (# feedings/day)	Feeding Rate Range (% B.W./day)	Food Conversion During Period
June	Rangen #0, #1, #2,#3	10	3.67	0.61
July	Rangen #2, #3/Skrettting Protec 1.5mm	8	2.83	0.62
August	Skretting Protec 1.5mm/Skretting slow sink 2.5mm	6	2.31	0.65
September	Skretting slow sink 2.5mm	6	1.61	0.72
October	Skretting slow sink 2.5mm and 3.5mm	4-6	1.37	0.83
November	Skretting slow sink 3.5mm	4-6	1.30	0.74
December	Skretting slow sink 3.5mm	4-6	1.23	0.98
January	Skretting slow sink 4.5mm	4-6	1.23	0.91
February	Skretting slow sink 4.5mm	4-6	1.15	1.01
March	Skretting slow sink 4.5mm	4-6	1.06	1.08
April	Skretting slow sink 4.5mm	4	0.97	1.36

Source: Niagara Springs Fish Hatchery Monthly Production Summaries (2000 - 2009) and NSFH staff.

9.2.7 Fish health monitoring, disease treatment, and sanitation procedures

IDFG Eagle Fish Health Laboratory staff conducts routine fish health inspections as needed at NSFH. This includes necropsies performed on sample fry to detect bacterial and viral rates of infection, to assess organ development, and to evaluate fish conformation. More frequent inspections occur if needed. Therapeutics may be used to treat specific disease agents via a medicated feed treatment (i.e. Oxytetracycline) or to inhibit disease agents via prophylactic vaccinations (i.e. Furogen dip). Disinfection protocols are in place for equipment, trucks and nets. All raceways are thoroughly pressure washed, chlorinated and air dried annually after fish have been transported to the release site at the Pahsimeroi River.

9.2.8 Smolt development indices (e.g. gill ATPase activity), if applicable

No smolt development indices are developed in this program.

9.2.9 Indicate the use of "natural" rearing methods as applied in the program

No natural or semi-natural rearing methods are intentionally applied. Lighted artificial bug killers are used during the summer months at the front of the raceways. Bugs are attracted to the light where they are killed by a rotating string and fall into the raceways to supplement the steelhead artificial diet. Shade covers are also used on the upper raceway sections to reduce the exposure of direct overhead sunlight on the fish. The rearing regime also provides some natural food items that are present in the spring water supply. Additionally, predator avoidance behaviors may be strengthened in the hatchery population by the presence of avian and mammalian predators that occasionally visit the outdoor rearing raceways.

9.2.10 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation

Fish under propagation are not ESA-listed; however, caution is used during incubation and rearing to reduce the potential for disease transmission. Fish are reared at NSFH at conservative density and flow indices (< 0.35 and < 1.0, respectively). At PFH egg incubation occurs on well water to limit exposure to pathogens, particularly *Myxobolus cerebralis*, the causative agent of whirling disease. The IDFG Eagle Fish Health Laboratory establishes fish health monitoring, disease treatment, and sanitation procedures.

SECTION 10. RELEASE

This section describes fish release levels, and release practices applied through the hatchery program.

10.1 PROPOSED FISH RELEASE LEVELS

Table 11. Proposed steelhead release levels from the Pahsimeroi Fish Hatchery.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Yearling	800,000 smolts	4.5 fpp	April	Pahsimeroi River

10.2 SPECIFIC LOCATION(S) OF PROPOSED RELEASE(S)

- **Stream, river, or watercourse:** Pahsimeroi River (hydrologic unit code = 7060202)
- **Release point:** Lower Pahsimeroi Fish Hatchery adult barrier weir (river kilometer code = 522.303.489.002)
- **Major watershed:** Salmon River
- **Basin or Region:** Salmon River Basin

10.3 ACTUAL NUMBERS AND SIZES OF FISH RELEASED BY AGE CLASS THROUGH THE PROGRAM

Table 12. Steelhead released to the Pahsimeroi River from this program, 1995-2017.

Brood Year	Release year	Release Dates	Total No. Smolts (Yearlings) Released	Average Size (fpp)	Stock	Release Location(s)
1994	1995	April 3 - 14	829,277	4.46	PAH-A	Pahsimeroi River
1995	1996	April 9 - 25	799,220	4.77	PAH-A	Pahsimeroi River
1996	1997	April 11 - 28	830,654	4.63	PAH-A	Pahsimeroi River
1997	1998	April 11 - 28	801,541	4.51	PAH-A	Pahsimeroi River
1998	1999	April 10 - 27	829,199	4.61	PAH-A	Pahsimeroi River
1999	2000	April 14 - May 4	830,316	4.29	PAH-A	Pahsimeroi River
2000	2001	April 14 - May 5	889,955	4.06	PAH-A	Pahsimeroi River
2001	2002	April 14 - May 4	836,713	3.94	PAH-A	Pahsimeroi River
2002	2003	April 12 - May 1	843,257	4.19	PAH-A	Pahsimeroi River
2003	2004	April 10 - 29	840,177	4.42	PAH-A	Pahsimeroi River
2004	2005	April 2 - 21	820,667	4.37	PAH-A	Pahsimeroi River
2005	2006	April 7 - 25	828,883	4.14	PAH-A	Pahsimeroi River
2006	2007	April 6 - 24	830,447	4.58	PAH-A	Pahsimeroi River
2007	2008	April 10 - 29	830,894	4.27	PAH-A	Pahsimeroi River
2008	20091	April 13 - May 3	825,525	3.66	PAH-A	Pahsimeroi River
2009	2010	April 9-29	832,907	3.89	PAH-A	Pahsimeroi River
2010	2011	April 12-28	819,853	5.19	PAH-A	Pahsimeroi River
2011	2012	March 26- April 9	807,960	5.25	PAH-A	Pahsimeroi River
2012	2013	March 26- April 5	782,532	6	PAH-A	Pahsimeroi River
2013	2014	April 4-23	818,653	4.38	PAH-A	Pahsimeroi River
2014	2015	April 2-21	824,777	4.28	PAH-A	Pahsimeroi River
2015	2016	April 5-25	836,505	3.93	PAH-A	Pahsimeroi River
2016	2017	Apirl7-10	806,020	4.69	PAH-A	Pahsimeroi River
10 Yr. Average			**818,563**	**4.554**		

Source: Niagara Springs Fish Hatchery Brood Year Reports (1994 - 2007) and IDFG unpublished data.

10.4 ACTUAL DATES OF RELEASE AND DESCRIPTION OF RELEASE PROTOCOLS

Table 15 provides specific release data. Summer steelhead yearling smolts are directly released from transport tankers into the Pahsimeroi River during the month of April. Releases are planned to coincide with rising water flows and temperatures in the Pahsimeroi River. Annual release dates may be adjusted based on water conditions, smolt size, and other environmental conditions.

10.5 Fish transportation procedures, if applicable

When being transported to offsite locations for release, smolts are crowded to the end of the raceways and pumped into three 5,000-gallon, fully insulated smolt tankers owned by IPC. Each smolt tanker has 3 compartments (2,000-gallon front, 1,000-gallon middle, 2,000-gallon rear) and is equipped with liquid oxygen, 5 mechanical aerators (2 in front, 1 in middle, 2 in rear), 8 microbubble oxygen diffusers (3 in front, 2 in middle, 3 in rear), 6 oxygen flow meters, and a low pressure liquid oxygen regulator. Smolt tankers are filled at the hatchery with spring water from Niagara Springs, which has a constant temperature of 59°F. NSFH uses a chiller to cool the spring water to approximately 42°F prior to filling the tankers for transport. Approximately 5,000 pounds of fish (at 4.5 fpp) are loaded into each truck. Transport to the release site at the Pahsimeroi River takes about four hours. Fish are not fed for a minimum of 48 hours prior to loading and transporting.

10.6 Acclimation procedures

Pahsimeroi A-run steelhead reared at NSFH are not acclimated prior to release. Fish are transported from NSFH and directly released into the Pahsimeroi River on the date of transport.

10.7 Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults

All of the steelhead released at Pahsimeroi Fish Hatchery as part of this program are mass marked with an adipose fin clip to identify them as hatchery fish.

10.8 Disposition plans for fish identified at the time of release as surplus to programmed or approved levels

Inventories in excess of the 800,000 smolt production goal for steelhead releases in the Pahsimeroi River are removed as fingerlings, not as full term smolts. Fingerling releases generally occur in the fall at local non-anadromous reservoirs.

10.9 Fish health certification procedures applied pre-release

Approximately 30 to 45 days prior to release, a 60 fish pre-liberation sample is taken from Pahsimeroi A-run stock to assess the prevalence of viral replicating agents and to detect the pathogens responsible for bacterial kidney disease. Fish are sampled randomly across the raceways at NSFH. In addition, an organosomatic index is developed for each raceway. Diagnostic services are provided by the IDFG Eagle Fish Health Laboratory.

10.10 Emergency release procedures in response to flooding or water system failure

A specific protocol for responding to emergency conditions has not been developed. Should a water system failure occur, hatchery personnel would likely remove raceway screens and allow fish to exit to the Snake River.

10.11 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological

EFFECTS TO LISTED FISH RESULTING FROM FISH RELEASES

Actions taken to minimize adverse effects on listed fish include:

- Continuing fish health practices to minimize the incidence of infectious disease agents. Follow IHOT, AFS, and PNFHPC guidelines.
- Marking hatchery-produced summer steelhead for broodstock management.
- Continuing to reduce the effect of releasing large numbers of hatchery summer steelhead at a single site by spreading annual releases over a number of days.
- Attempting to program time of release to mimic natural fish emigration for Pahsimeroi River smolt releases.
- Continuing to use broodstock for general production that exhibit life history characteristics similar to locally evolved stocks.
- Monitoring hatchery effluent to ensure compliance with National Pollutant Discharge Elimination System permit.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

IDFG's monitoring of hatchery programs is designed to evaluate benefits and risks of the programs and to inform adaptive management to maximize program benefits and reduce risks. Hatchery monitoring programs evaluate specific performance indicators in the following categories; Legal Mandates, Implementation and Compliance, Hatchery Effectiveness Monitoring, Operations, and Socioeconomic Effectiveness (see Table 1, Section 1.9) using quantitative and qualitative information. The table describes standards and indicators for each category. Links to documents describing the monitoring efforts are provided where additional detail may be warranted.

11.1.1 Describe plans and methods proposed to collect data necessary to respond to each Performance Indicator identified for the program

Specific performance indicators are described in Table 13. Performance indicators are reported annually in Hatchery Steelhead Annual and Brood Year Reports Available for download here:

2014 Calendar Year Report:
https://collaboration.idfg.idaho.gov/FisheriesTechnicalReports/Res16-06Warren2014Calendar%20Year%20Hatchery%20Steelhead.pdf

https://collaboration.idfg.idaho.gov/FisheriesTechnicalReports/Res16-10WarrenBY2007Steelhead%20Hatchery%20Evaluations%20Report.pdf

Wild steelhead monitoring is reported annually in the steelhead Natural Production Monitoring Program reports available for download here.

https://collaboration.idfg.idaho.gov/FisheriesTechnicalReports/Res16-20Stark2015%20Idaho%20Adult%20Steelhead%20Monitoring.pdf

https://collaboration.idfg.idaho.gov/FisheriesTechnicalReports/Res16-07Apperson%20Idaho%20Anadromous%20Emigrant%20Monitoring%202014%20and%202015%20Annual%20Report.pdf

Table 13. Standardized performance indicators and definitions for status and trends and hatchery effectiveness monitoring (Galbreath et al. 2008; appendix C).

Performance Measure		**Definition**
	Adult Escapement to Tributary	Number of adults (including jacks) that have escaped to a certain point (i.e. - mouth of stream). Population based measure. Calculated with mark recapture methods from weir data adjusted for redds located downstream of weirs and in tributaries, and maximum net upstream approach for DIDSON and underwater video monitoring. Provides total escapement and wild only escapement. [Assumes tributary harvest is accounted for]. Uses TRT population definition where available
	Fish per Redd	Number of fish divided by the total number of redds. Applied by: The population estimate at a weir site, minus broodstock and mortalities and harvest, divided by the total number of redds located upstream of the weir.

	Female Spawner per Redd	Number of female spawners divided by the total number of redds above weir. Applied in 2 ways: 1) The population estimate at a weir site multiplied by the weir derived proportion of females, minus the number of female prespawn mortalities, divided by the total number of redds located upstream of the weir, and 2) DIDSON application calculated as in 1 above but with proportion females from carcass recoveries. Correct for mis-sexed fish at weir for 1 above.
	Index of Spawner Abundance - redd counts	Counts of redds in spawning areas in index area(s) (trend), extensive areas, and supplemental areas. Reported as redds and/or redds/km.
	Spawner Abundance	In-river: Estimated number of total spawners on the spawning ground. Calculated as the number of fish that return to an adult monitoring site, minus broodstock removals and weir mortalities and harvest if any, subtracts the number of female prespawning mortalities and expanded for redds located below weirs. Calculated in two ways: 1) total spawner abundance, and 2) wild spawner abundance which multiplies by the proportion of natural origin (wild) fish. Calculations include jack salmon. In-hatchery: Total number of fish actually used in hatchery production. Partitioned by gender and origin.
	Hatchery Fraction	Percent of fish on the spawning ground that originated from a hatchery. Applied in two ways: 1) Number of hatchery carcasses divided by the total number of known origin carcasses sampled. Uses carcasses above and below weirs, 2) Uses weir data to determine number of fish released above weir and calculate as in 1 above, and 3) Use 2 above and carcasses above and below weir.
	Ocean/Mainstem Harvest	Number of fish caught in ocean and mainstem (tribal, sport, or commercial) by hatchery and natural origin.
	Harvest Abundance in Tributary	Number of fish caught in ocean and mainstem (tribal, sport, or commercial) by hatchery and natural origin.
	Index of Juvenile Abundance (Density)	Parr abundance estimates using underwater survey methodology are made at pre-established transects. Densities (number per 100 m2) are recorded using protocol described in Thurow (1994). Hanken & Reeves estimator.
	Juvenile Emigrant Abundance	Gauss software is (Aptech Systems, Maple Valley, Washington) is used to estimate emigration estimates. Estimates are given for parr pre-smolts, smolts and the entire migration year. Calculations are completed using the Bailey Method and bootstrapping for 95% CIs. Gauss program developed by the University of Idaho (Steinhorst 2000).
	Smolts	Smolt estimates, which result from juvenile emigrant trapping and PIT tagging, are derived by estimating the proportion of the total juvenile abundance estimate at the tributary comprised of each juvenile life stage (parr, presmolt, smolt) that survive to first mainstem dam. It is calculated by multiplying the life stage specific abundance estimate (with standard error) by the life stage specific survival estimate to first mainstem dam (with standard error). The standard error around the smolt equivalent estimate is calculated using

		the following formula; where X = life stage specific juvenile abundance estimate and Y = life stage specific juvenile survival estimate: $Var(X \cdot Y)$ $= E(X)^2 \cdot Var(Y) + E(Y)^2 \cdot Var(X) + Var(X) \cdot Var(Y)$
	Run Prediction	This will not be in the raw or summarized performance database.
Survival – Productivity	Smolt-to-Adult Return Rate	The number of adult returns from a given brood year returning to a point (stream mouth, weir) divided by the number of smolts that left this point 1-5 years prior. Calculated for wild and hatchery origin conventional and captive brood fish separately. Adult data applied in two ways: 1) SAR estimate to stream using population estimate to stream, 2) adult PIT tag SAR estimate to escapement monitoring site (weirs, LGR), and 3) SAR estimate with harvest. Accounts for all harvest below stream. *Smolt-to-adult return rates* are generated for four performance periods; tributary to tributary, tributary to tributary, tributary to first mainstem dam, first mainstem dam to first mainstem dam, and first mainstem dam to tributary. *First mainstem dam to first mainstem dam S*AR estimates are calculated by dividing the number of PIT tagged adults returning to first mainstem dam by the estimated number of PIT tagged juveniles at first mainstem dam. Variances around the point estimates are calculated as described above. *Tributary to tributary SAR* estimates for natural and hatchery origin fish are calculated using PIT tag technology as well as direct counts of fish returning to the drainage. PIT tag SAR estimates are calculated by dividing the number of PIT tag adults returning to the tributary (by life stage and origin type) by the number of PIT tagged juvenile fish migrating from the tributary (by life stage and origin type). Overall PIT tag SAR estimates for natural fish are then calculated by averaging the individual life stage specific SAR's. Direct counts are calculated by dividing the estimated number of natural and hatchery-origin adults returning to the tributary (by length break-out for natural fish) by the estimated number of natural-origin fish and the known number of hatchery-origin fish leaving thetributary. *Tributary to* first mainstem dam SAR estimates are calculated by dividing the number of PIT tagged adults returning to first mainstem dam by the number of PIT tagged juveniles tagged in the tributary. There is no associated variance around this estimate. The adult detection probabilities at first mainstem dam are near 100 percent. First mainstem dam *to tributary* SAR estimates are calculated by dividing the number of PIT tagged adults returning to the tributary by the estimated number of PIT tagged juveniles at first mainstem dam. The estimated number of PIT tagged juveniles at first mainstem dam is calculated by multiplying lifestage specific survival estimates (with standard errors) by the number of juveniles PIT tagged in the tributary. The variance for the estimated number of PIT tagged juveniles at first mainstem dam is calculated as follows, where X = the number of PIT tagged fish in the tributary and Y = the variance of the lifestage specific survival estimate: *Var*( ) $= X^2 \cdot Var(Y)$ The variance around the SAR estimate is calculated as follows, where X = the number of adult PIT tagged fish returning to the tributary and Y = the estimated number of juvenile PIT tagged fish at first mainstem dam : $Var\left(\frac{X}{Y}\right) = \left(\frac{EX}{EY}\right)^2 \cdot \left(\frac{Var(Y)}{(EY)^2}\right)$
	Progeny-per- Parent Ratio	Adult to adult calculated for naturally spawning fish and hatchery fish separately as the brood year ratio of return adult to parent spawner abundance using data above weir. Two variants calculated: 1) escapement, and 2) spawners.
	Recruit/spawner (R/S)(Smolt Equivalents per Redd or female)	Juvenile production to some life stage divided by adult spawner abundance. Derive adult escapement above juvenile trap multiplied by the prespawning mortality estimate. Adjusted for redds above juv. Trap. *Recruit per spawner* estimates, or *juvenile abundance (can be various life stages or locations) per redd/female*, is used to index population productivity, since it represents the quantity of juvenile fish resulting from an average redd (total smolts divided by total redds) or female. Several forms of juvenile life stages are applicable. We utilize two measures: 1) juvenile abundance (parr, presmolt, smolt, total abundance) at the tributary mouth, and 2) smolt abundance at first mainstem dam.

	Pre-spawn Mortality	Percent of female adults that die after reaching the spawning grounds but before spawning. Calculated as the proportion of "25% spawned" females among the total number of female carcasses sampled. ("25% spawned" = a female that contains 75% of her egg compliment].
	Juvenile Survival to first mainstem dam	Life stage survival (parr, presmolt, smolt, subyearling) calculated by CJS Estimate (SURPH) produced by PITPRO 4.8+ (recapture file included), CI estimated as 1.96*SE. Apply survival by life stage to first mainstem dam to estimate of abundance by life stage at the tributary and the sum of those is total smolt abundance surviving to first mainstem dam . Juvenile survival to first mainstem dam = total estimated smolts surviving to first mainstem dam divided by the total estimated juveniles leaving tributary.
	Juvenile Survival to all Mainstem Dams	*Juvenile survival to first mainstem dam and subsequent Mainstem Dam(s)*, which is estimated using PIT tag technology. Survival by life stage to and through the hydrosystem is possible if enough PIT tags are available from the stream. Using tags from all life stages combined we will calculate (SURPH) the survival to all mainstem dams.
	Post-release Survival	Post-release survival of natural and hatchery-origin fish are calculated as described above in the performance measure "Survival to first mainstem dam and Mainstem Dams". No additional points of detection (i.e screwtraps) are used to calculate survival estimates.
Distribution	Adult Spawner Spatial Distribution	Extensive area tributary spawner distribution. Target GPS red locations or reach specific summaries, with information from carcass recoveries to identify hatchery-origin vs. natural-origin spawners across spawning areas within populations.
	Stray Rate (percentage)	Estimate of the number and percent of hatchery origin fish on the spawning grounds, as the percent within MPG, and percent out of ESU. Calculated from 1) total known origin carcasses, and 2) uses fish released above weir. Data adjusted for unmarked carcasses above and below weir.
	Juvenile Rearing Distribution	Chinook rearing distribution observations are recorded using multiple divers who follow protocol described in Thurow (1994).
	Disease Frequency	Natural fish mortalities are provided to certified fish health lab for routine disease testing protocols. Hatcheries routinely samples fish for disease and will defer to then for sampling numbers and periodicity
Genetic	Genetic Diversity	Indices of genetic diversity – measured within a tributary) heterozygosity – allozymes, microsatellites), or among tributaries across population aggregates (e.g., FST).
	Reproductive Success (Nb/N)	Derived measure: determining hatchery:wild proportions, effective population size is modeled.
	Relative Reproductive Success (Parentage)	Derived measure: the relative production of offspring by a particular genotype. Parentage analyses using multilocus genotypes are used to assess reproductive success, mating patterns, kinship, and fitness in natural pop8ulations and are gaining widespread use of with the development of highly polymorphic molecular markers.
	Effective Population Size (Ne)	Derived measure: the number of breeding individuals in an idealized population that would show the same amount of dispersion of allele frequencies under random genetic drift or the same amount of inbreeding as the population under consideration.
Life History	Age Structure	Proportion of escapement composed of adult individuals of different brood years. Calculated for wild and hatchery origin conventional and captive brood adult returns. Accessed via scale method, dorsal fin ray ageing, or mark recoveries. Juvenile Age is determined by brood year (year when eggs are placed in the gravel) Then Age is determined by life stage of that year. Methods to age Chinook captured in screwtrap are by dates; fry – prior to July 1; parr – July 1-August 31; presmolt – September 1 – December 31; smolt – January 1 – June 30; yearlings – July 1 – with no migration until following spring. The age class structure of juveniles is determined using length frequency breakouts for natural-origin fish. Scales have been collected from natural-origin juveniles, however, analysis of the scales have never been completed. The age of hatchery-origin fish is determined through a VIE marking program which identifies fish by brood year. For steelhead we attempt to use length frequency but typically age of juvenile steelhead is not calculated.
	Age–at–Return	Age distribution of spawners on spawning ground. Calculated for wild and hatchery conventional and captive brood adult returns. Accessed via scale method, dorsal fin ray ageing, or mark recoveries.
	Age–at-Emigration	Juvenile Age is determined by brood year (year when eggs are placed in the gravel) Then Age is determined by life stage of that year. Methods to age Chinook captured in screwtrap are by dates; fry – prior to July 1; parr – July 1-August 31; presmolt – September 1 – December 31; smolt – January 1 – June 30; yearlings – July 1 – with no migration until following spring. The age class structure of juveniles is determined using length frequency breakouts for natural-origin fish. Scales have been collected from natural-origin juveniles, however, analysis of the scales have never been completed. The age of hatchery-origin fish is determined through a VIE marking program which identifies fish by brood year. For steelhead we attempt to use length frequency but typically age of juvenile steelhead is not calculated.
	Size-at-Return	Size distribution of spawners using fork length and mid-eye hypural length. Raw database measure only.

	Size-at-Emigration	Fork length (mm) and weight (g) are representatively collected weekly from natural juveniles captured in emigration traps. Mean fork length and variance for all samples within a lifestage-specific emigration period are generated (mean length by week then averaged by lifestage). For entire juvenile abundance leaving a weighted mean (by lifestage) is calculated. Size-at-emigration for hatchery production is generated from pre release sampling of juveniles at the hatchery.
	Condition of Juveniles at Emigration	Condition factor by life stage of juveniles is generated using the formula: $K = (w/l^3)(10^4)$ where K is the condition factor, w is the weight in grams (g), and l is the length in millimeters (Everhart and Youngs 1992).
	Percent Females (adults)	The percentage of females in the spawning population. Calculated using 1) weir data, 2) total known origin carcass recoveries, and 3) weir data and unmarked carcasses above and below weir. Calculated for wild, hatchery, and total fish.
	Adult Run-timing	Arrival timing of adults at adult monitoring sites (weir, DIDSON, video) calculated as range, 10%, median, 90% percentiles. Calculated for wild and hatchery origin fish separately, and total.
	Spawn-timing	This a raw database measure only.
	Juvenile Emigration Timing	Juvenile emigration timing is characterized by individual life stages at the rotary screw trap and Lower Granite Dam. Emigration timing at the rotary screw trap is expressed as the percent of total abundance over time while the median, 0%, 10, 50%, 90% and 100% detection dates are calculated for fish at first mainstem dam.
	Mainstem Arrival Timing (Lower Granite)	Unique detections of juvenile PIT-tagged fish at first mainstem dam are used to estimate migration timing for natural and hatchery origin tag groups by lifestage. The actual Median, 0, 10%, 50%, 90% and 100% detection dates are reported for each tag group. Weighted detection dates are also calculated by multiplying unique PIT tag detection by a life stage specific correction factor (number fish PIT tagged by lifestage divided by tributary abundance estimate by lifestage). Daily products are added and rounded to the nearest integer to determine weighted median, 0%, 50%, 90% and 100% detection dates.
Habitat	Physical Habitat	TBD
	Stream Network	TBD
	Passage Barriers/Diversions	TBD
	Instream Flow	USGS gauges and also staff gauges
	Water Temperature	Various, mainly Hobo and other temp loggers at screw trap sights and spread out throughout the streams
	Chemical Water Quality	TBD
	Macroinvertebrate Assemblage	TBD
	Fish and Amphibian Assemblage	Observations through rotary screwtrap catch and while conducting snorkel surveys.
In-Hatchery Measures	Hatchery Production Abundance	The number of hatchery juveniles of one cohort released into the receiving stream per year. Derived from census count minus prerelease mortalities or from sample fish- per-pound calculations minus mortalities. Method dependent upon marking program (census obtained when 100% are marked).
	In-hatchery Life Stage Survival	In-hatchery survival is calculated during early life history stages of hatchery-origin juvenile Chinook. Enumeration of individual female's live and dead eggs occurs when the eggs are picked. These numbers create the inventory with subsequent mortality subtracted. This inventory can be changed to the physical count of fish obtained during CWT or VIE tagging. These physical fish counts are the most accurate inventory method available. The inventory is checked throughout the year using 'fish-per-pound' counts. Estimated survival of various in-hatchery juvenile stages (green egg to eyed egg, eyed egg to ponded fry, fry to parr, parr to smolt and overall green egg to release) Derived from census count minus prerelease mortalities or from sample fish- per-pound calculations minus mortalities. Life stage at release varies (smolt, presmolt, parr, etc.).
	Size-at-Release	Mean fork length measured in millimeters and mean weight measured in grams of a hatchery release group. Measured during prerelease sampling. Sample size determined by individual facility and M&E staff. Life stage at release varies (smolt, presmolt, parr, etc.).
	Juvenile Condition Factor	Condition Factor (K) relating length to weight expressed as a ratio. Condition factor by life stage of juveniles is generated using the formula: $K = (w/l^3)(10^4)$ where K is the condition factor, w is the weight in grams (g), and l is the length in millimeters (Everhart and Youngs 1992).
	Fecundity by Age	The reproductive potential of an individual female. Estimated as the number of eggs in the ovaries of the individual female. Measured as the number of eggs per female calculated by weight or enumerated by egg counter.

	Spawn Timing	Spawn date of broodstock spawners by age, sex and origin, Also reported as cumulative timing and median dates.
	Hatchery Broodstock Fraction	Percent of hatchery broodstock actually used to spawn the next generation of hatchery F1s. Does not include prespawn mortality.
	Hatchery Broodstock Prespawn Mortality	Percent of adults that die while retained in the hatchery, but before spawning.
	Female Spawner ELISA Values	Screening procedure for diagnosis and detection of BKD in adult female ovarian fluids. The enzyme linked immunosorbent assay (ELISA) detects antigen of *R. salmoninarum.*
	In-Hatchery Juvenile Disease Monitoring	Screening procedure for bacterial, viral and other diseases common to juvenile salmonids. Gill/skin/ kidney /spleen/skin/blood culture smears conducted monthly on 10 mortalities per stock
	Length of Broodstock Spawner	Mean fork length by age measured in millimeters of male and female broodstock spawners. Measured at spawning and/or at weir collection. Is used in conjunction with scale reading for aging.
	Prerelease Mark Retention	Percentage of a hatchery group that have retained a mark up until release from the hatchery. Estimated from a sample of fish visually calculated as either "present" or "absent"
	Prerelease Tag Retention	Percentage of a hatchery group that have retained a tag up until release from the hatchery - estimated from a sample of fish passed as either "present" or "absent". ("Marks" refer to adipose fin clips or VIE batch marks).
	Hatchery Release Timing	Date and time of volitional or forced departure from the hatchery. Normally determined through PIT tag detections at facility exit (not all programs monitor volitional releases).
	Chemical Water Quality	Hatchery operational measures included: dissolved oxygen (DO) - measured with DO meters, continuously at the hatchery, and manually 3 times daily at acclimation facilities; ammonia ^{3}) nitrite (^{2}), -measured weekly only at reuse facilities (Kooskia Fish Hatchery).
	Water Temperature	Hatchery operational measure (Celsius) - measured continuously at the hatchery with thermographs and 3 times daily at acclimation facilities with hand-held devices.

11.1.2 Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program

Prioritization of monitoring activities will, in part, be guided by ESA requirements, best management practices consistent with recommendations from the HRT and HSRG, regionally identified hatchery effectiveness monitoring priorities, and the feasibility of completing certain monitoring activities. We do not necessarily intend to pursue funding to address all applicable indicators.

SECTION 12. RESEARCH

Provide the following information for any research programs conducted in direct association with the hatchery program described in this HGMP. Provide sufficient detail to allow for the independent assessment of the effects of the research program on listed fish. If applicable, correlate with research indicated as needed in any ESU hatchery plan approved by the co-managers and NMFS.

There is no research being conducted that is directly associated with the steelhead program at Pahsimeroi Fish Hatchery.

12.1 OBJECTIVE OR PURPOSE

12.2 COOPERATING AND FUNDING AGENCIES

12.3 PRINCIPLE INVESTIGATOR OR PROJECT SUPERVISOR AND STAFF

12.4 STATUS OF STOCK, PARTICULARLY THE GROUP AFFECTED BY PROJECT, IF DIFFERENT THAN THE STOCK(S) DESCRIBED IN SECTION 2

12.5 TECHNIQUES: INCLUDE CAPTURE METHODS, DRUGS, SAMPLES COLLECTED, TAGS APPLIED

12.6 DATES OR TIME PERIOD IN WHICH RESEARCH ACTIVITY OCCURS

12.7 CARE AND MAINTENANCE OF LIVE FISH OR EGGS, HOLDING DURATION, TRANSPORT METHODS

12.8 EXPECTED TYPE AND EFFECTS OF TAKE AND POTENTIAL FOR INJURY OR MORTALITY.

12.9 LEVEL OF TAKE OF LISTED FISH: NUMBER OR RANGE OF FISH HANDLED, INJURED, OR KILLED BY SEX, AGE, OR SIZE, IF NOT ALREADY INDICATED IN SECTION 2 AND THE ATTACHED "TAKE TABLE" (TABLE 1)

12.10 ALTERNATIVE METHODS TO ACHIEVE PROJECT OBJECTIVES

12.11 LIST SPECIES SIMILAR OR RELATED TO THE THREATENED

SPECIES; PROVIDE NUMBER AND CAUSES OF MORTALITY RELATED TO THIS RESEARCH PROJECT

12.12 INDICATE RISK AVERSION MEASURES THAT WILL BE APPLIED TO MINIMIZE THE LIKELIHOOD FOR ADVERSE ECOLOGICAL EFFECTS, INJURY, OR MORTALITY TO LISTED FISH AS A RESULT OF THE PROPOSED RESEARCH ACTIVITIES

SECTION 13. ATTACHMENTS AND CITATIONS

Include all references cited in the HGMP. In particular, indicate hatchery databases used to provide data for each section. Include electronic links to the hatchery databases used (if feasible), or to the staff person responsible for maintaining the hatchery database referenced (indicate email address). Attach or cite (where commonly available) relevant reports that describe the hatchery operation and impacts on the listed species or its critical habitat. Include any EISs, EAs, Biological Assessments, benefit/risk assessments, or other analysis or plans that provide pertinent background information to facilitate evaluation of the HGMP.

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____________________________ Date:_____________

SECTION 15 PROGRAM EFFECTS ON OTHER (NON-ANADROMOUS SALMONID) ESA-LISTED POPULATIONS

See Biological Opinion on USFWS Listed Species for Salmon and Steelhead Hatchery Programs in the Salmon River Basin.

15.1.1 List all ESA permits or authorizations for bull trout associated with the hatchery program.

15.1.2 Description of bull trout and habitat that may be affected by hatchery program

15.1.3 Analysis of effects on bull trout

15.1.4 Actions taken to mitigate for potential effects on bull trout

15.3 REFERENCES

Appendix A

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Natural-origin Summer steelhead **ESU/Population**: Snake River DPS (Pahsimeroi River population) **Activity**:Hatchery Weir Operation: (adult capture and broodstock collection)				
Location of hatchery activity: Pahsimeroi River (1.6km upstream of mouth) **Dates of activity**: February-May annually **Hatchery program operator**: Doug Engemann (IDFG)				
	Annual Take of Listed Fish By Life Stage (Number of Fish)			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)			400*	
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)			4	
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.
* up to 100% of the natural origin return will be trapped, handled, sampled and released

ATTACHMENT 1. DEFINITION OF TERMS REFERENCED IN THE HGMP TEMPLATE.

Augmentation - The use of artificial production to increase harvestable numbers of fish in areas where the natural freshwater production capacity is limited, but the capacity of other salmonid habitat areas will support increased production. Also referred to as “fishery enhancement”.

Critical population threshold - An abundance level for an independent Pacific salmonid population below which: depensatory processes are likely to reduce it below replacement; short-term effects of inbreeding depression or loss of rare alleles cannot be avoided; and productivity variation due to demographic stochasticity becomes a substantial source of risk.

Direct take - The intentional take of a listed species. Direct takes may be authorized under the ESA for the purpose of propagation to enhance the species or research.

Evolutionarily Significant Unit (ESU) - NMFS definition of a distinct population segment (the smallest biological unit that will be considered to be a species under the Endangered Species Act). A population will be/is considered to be an ESU if 1) it is substantially reproductively isolated from other conspecific population units, and 2) it represents an important component in the evolutionary legacy of the species.

Harvest project - Projects designed for the production of fish that are primarily intended to be caught in fisheries.

Hatchery fish - A fish that has spent some part of its life-cycle in an artificial environment and whose parents were spawned in an artificial environment.

Hatchery population - A population that depends on spawning, incubation, hatching or rearing in a hatchery or other artificial propagation facility.

Hazard - Hazards are undesirable events that a hatchery program is attempting to avoid.

Incidental take - The unintentional take of a listed species as a result of the conduct of an otherwise lawful activity.

Integrated harvest program - Project in which artificially propagated fish produced primarily for harvest are intended to spawn in the wild and are fully reproductively integrated with a particular natural population.

Integrated recovery program - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), and fish produced are intended to spawn in the wild or be genetically integrated with the targeted natural population(s). Sometimes referred to as “supplementation”.

Isolated harvest program - Project in which artificially propagated fish produced primarily for harvest are not intended to spawn in the wild or be genetically integrated with any specific natural population.

Isolated recovery program - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), but the fish produced are not intended to spawn in the wild or be genetically integrated with any specific natural population.

Mitigation - The use of artificial propagation to produce fish to replace or compensate for loss of fish or fish production capacity resulting from the permanent blockage or alteration of habitat by human activities.

Natural fish - A fish that has spent essentially all of its life-cycle in the wild and whose parents spawned in the wild. Synonymous with natural origin recruit (NOR).

Natural origin recruit (NOR) - See natural fish

Natural population - A population that is sustained by natural spawning and rearing in the natural habitat.

Population - A group of historically interbreeding salmonids of the same species of hatchery, natural, or unknown parentage that have developed a unique gene pool, that breed in approximately the same place and time, and whose progeny tend to return and breed in approximately the same place and time. They often, but not always, can be separated from another population by genotypic or demographic characteristics. This term is synonymous with stock.

Preservation (Conservation) - The use of artificial propagation to conserve genetic resources of a fish population at extremely low population abundance, and potential for extinction, using methods such as captive propagation and cryopreservation.

Research - The study of critical uncertainties regarding the application and effectiveness of artificial propagation for augmentation, mitigation, conservation, and restoration purposes, and identification of how to effectively use artificial propagation to address those purposes.

Restoration - The use of artificial propagation to hasten rebuilding or reintroduction of a fish population to harvestable levels in areas where there is low, or no natural production, but potential for increase or reintroduction exists because sufficient habitat for sustainable natural production exists or is being restored.

Stock - (see “Population”).

Take - To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Viable population threshold - An abundance level above which an independent Pacific salmonid population has a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame.

ATTACHMENT 2. AGE CLASS DESIGNATIONS BY FISH SIZE AND SPECIES FOR SALMONIDS RELEASED FROM HATCHERY FACILITIES.

(generally from Washington Department of Fish and Wildlife, November, 1999).

Species	Age Class	Number of fish/pound	Size Criteria (grams/fish)
Chinook	Yearling	<=20	>=23
	Fingerling (Zero)	20 to 150	3 to <23
	Fry	>150 to 900	0.5 to <3
	Unfed Fry	>900	<0.5
Coho	Yearling [1]	<20	>=23
	Fingerling	>20 to 200	2.3 to <23
	Fry	>200 to 900	0.5 to <2.3
	Unfed Fry	>900	<0.5
Chum	Fed Fry	<=1000	>=0.45
	Unfed Fry	>1000	<0.45
Sockeye	Yearling [2]	<=20	>=23
	Fingerling	>20 to 800	0.6 to <23
	Fall Releases	<150	>2.9
	Fry	>800 to 1500	0.3 to <0.6
	Unfed Fry	>1500	<0.3
Pink	Fed Fry	<=1000	>=0.45
	Unfed Fry	>1000	<0.45
Steelhead	Smolt	<=10	>=45
	Yearling	<=20	>=23
	Fingerling	>20 to 150	3 to <23
	Fry	>150	<3
Cutthroat Trout	Yearling	<=20	>=23
	Fingerling	>20 to 150	3 to <23
	Fry	>150	<3
Trout	Legals	<=10	>=45
	Fry	>10	<45

[1] Coho yearlings defined as meeting size criteria and 1 year old at release, and released prior to June 1st.
[2] Sockeye yearlings defined as meeting size criteria and 1 year old.